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COMPUTERWORLD

Users eyeing micro leaders' low-end focus

IBM, Compaq efforts target lost market share

BY CAROL HILDEBRAND and MICHAEL FITZGERALD
CW STAFF

Despite concerns that a new emphasis on drastic cost-cutting at IBM and Compaq Computer Corp. could adversely affect product quality, many users are still eagerly awaiting the arrival of $700 386SX-based personal computers from the market's Big Two.

Once known for building premium products at premium prices, a chastened Compaq has refocused on building low-cost PCs. Meanwhile, a struggling IBM is weighing a move into the mail-order channel and has invested in a venture with a Far East clone maker to sell low-end, non-IBM labeled PCs in Europe.

While keeping intact their flagship product lines — complete with traditional dealer channels — the two PC giants are looking to woo customers through several new product

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Rating routers

Users surveyed on multiprotocol routers gave the 3Com products a near-perfect rating in reliability — the most important evaluation area.
See Buyers' Scorecard, page 113

Product	Score
3Com	9.2
Cisco	8.3
Proteon	7.8

Maximum score: 10

CW Chart: Janell Genovese

IBM tape library off on wrong track

Tale of the tape

The new IBM and Storage Tek automated tape library systems:

	IBM 3495	Storage Tek PowderHorn
Floor space	Linear configuration that requires between 30 ft. and 92 ft. of wall space	Round, 12-sided shape, 6 ft. (high) by 3 ft. (wide) by 5 ft. (deep)*
Multivendor connectivity	No	Yes
Capacity	Four models holding between 6,500 and 18,900 cartridges	6,000-cartridge capacity
Robotics	One robot, one arm	One robot, two arms
Media	18- and 36-track tape	18-track tape initially
Price	$400,000 to $850,000	$305,000; drives are $20,000
General availability	Q1 1993	Q1 1990

*Includes library and management bay

BY JOHANNA AMBROSIO
CW STAFF

TUCSON, Ariz. — As IBM prepares to introduce its automated tape library tomorrow, more than five years after the competition, users and industry watchers are asking: Is that all there is?

After all the time and effort, they said, the 3495 Tape Library Data Server hardly seems worth the wait. Although there are some technological niceties in the IBM system — notably its sophisticated tape management software — the resulting product does not appear to be significantly faster or less expensive than competing products. And the IBM system's design will require a significant amount of floor space — 92 feet for the largest model, according to users and analysts who have been given a peek at the product.

Large users seem particularly unenthusiastic about the 3495, although analysts said small to medium-size shops that have not already committed to archrival Storage Technology Corp. might be interested. Storage Tek extended its line this week (see story page 16).

"I have told IBM marketing reps repeatedly that I have very little interest in their silo. IBM missed the market," said Robert Shaffer, general manager of information systems computer operations at Nynex Corp.'s telesector resources group in Boston. "IBM will have to significantly underprice and outperform Storage Tek to make inroads."

George Sekely, vice president of computers and communications at Canadian Pacific Ltd. in Toronto, was equally blunt: "They are a decade late, and I don't know how they would have the audacity to knock on my door at this late date."

Robots that fetch

The 3495 is said to look like a "big black bowling alley" with railroad tracks along which a robot moves to retrieve IBM 3490 tape cartridges. The robot finds the correct cartridge and then mounts the cartridge into the

Continued on page 16

A FEDERAL CASE

Why Uncle Sam can't compute

BY GARY H. ANTHES
CW STAFF

The Farmers Home Administration provides a textbook example of how not to manage large development projects, having spent nine years and $26 million on two aborted efforts to overhaul its computer systems.

Now the U.S. General Accounting Office has said the federal agency's third effort may be headed down the tubes as well. The GAO claims that the agency has not solved the planning and oversight problems that doomed its earlier efforts and that its new half billion dollar project presents "an unacceptable risk that systems . . . may not meet users' needs."

Unfortunately, the loan agency is not alone in its woes. The GAO produces an average of one report a week criticizing various government information systems management practices. In a recent summary of 132 such reports, the congressional audit agency grouped its findings into 10 IS problem areas ranging from inadequate management to cost overruns to inaccurate data (see story page 20).

In interviews with government officials and vendors, *Computerworld* found little consensus as to why Uncle Sam has so many IS fiascoes. Fingers point at everything from poor training of contracting officials to outdated development methodologies. However, many people said they feel the government has begun taking promising steps to improve.

"Agencies are getting better at articulating management problems, but I haven't seen any

Continued on page 20

Sponsors take hard look at OSF's role

BY MARYFRAN JOHNSON
CW STAFF

CAMBRIDGE, Mass. — The fate of the Open Software Foundation will be determined this summer in a series of OSF board meetings, as major sponsors IBM, Digital Equipment Corp. and Hewlett-Packard Co. guide the 4-year-old industry consortium through a classic case of business re-engineering.

"Everything is a consideration," said David Stone, vice president of DEC's software product group and a member of the OSF's board of directors. "All fixed religious beliefs have been canceled because of business economics."

Those business economics encompass dramatic industry power shifts since the OSF's 1988 founding, when IBM, DEC and HP were frantic that an alliance between Sun Microsystems, Inc. and AT&T would create a Unix market monopoly.

HP's Jim Bell keeping his options open

Today, however, there is increasing cooperation between the two Unix camps — the OSF and the now-independent Unix System Laboratories, Inc. — and a dwindling need for the OSF to produce its own "standard" Unix.

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HP to take minis into the mainframe world. Page 4.

IBM offers long view of SystemView. Page 8.

Notes to get imaging component. Page 10.

In Depth — What it took for three female IS executives to make it to mahogany row. Page 115.

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8 Some IS teams are adopting IBM's **System-View** because they see it as the only game in town.

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Quotable

"They are a decade late, and I don't know how they would have the audacity to knock on my door at this late date."

GEORGE SEKELY
CANADIAN PACIFIC

On IBM's late introduction of an automated tape library. See story page 1.

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The 5th Wave

"SO I SAID, 'WAITER! WAITER! THERE'S A BUG IN MY SOUP!' AND HE SAYS, 'SORRY, SIR, THE CHEF USED TO PROGRAM COMPUTERS.' AHH HAHA HAHA THANK YOU! THANK YOU!"

EXECUTIVE BRIEFING

■ **IBM's first automated tape library, due to be introduced tomorrow, has users and analysts wondering** what took so long. The IBM offering, which trails rival Storage Tek's system by more than five years, does not seem poised to take the market by storm. **Page 1.**

■ **Three female IS chiefs beat the odds,** crossing over from the technical side to become high-level business executives: Xerox's Patricia Barron, Kodak's Katherine Hudson and Weyerhaeuser's Susan Mersereau say they overcame a 'double whammy' — a functional bias that hinders lateral movement as well as a gender bias — through hard work, determination and broadly varied career paths. **Page 115.**

■ **Apple Computer will unleash a barrage of new products** this year. Expect speedier personal computers, an expanded PowerBook notebook line and more systems packaged with compact disc/read-only memory disk drives. **Page 4.**

■ **Object-oriented Cobol should find its niche** in the corporate world. A standard may be a year away, but some users are thinking of using an object-oriented version of the popular commercial computing language for new applications. **Page 95.**

■ **Led by IBM, DEC and HP, the Open Software Foundation's board of directors will reshape** the nonprofit organization to better fit the shifting Unix scene. Users should benefit from a permanent truce in the Unix wars and the OSF's greater concentration on the Unix software needed to manage distributed computing environments. **Page 1.**

■ **The federal government seems to have one computer project mega-disaster** after another, but Uncle Sam is trying some new approaches to procuring systems that observers say have promise. **Page 1.**

■ **Some pretty impressive productivity numbers** are emerging from applications based on AI. Several of the 19 winners of an annual competition sponsored by the American Association for Artificial Intelligence are measuring results in millions of dollars and in weeks of worker time. **Page 87.**

■ **Once-proud premium players IBM and Compaq are in hot pursuit of the** low-end PC market. But users, even as they eye the savings potential with glee, express concern that lower cost could mean lower quality. **Page 1.**

■ **Be careful with router throughput statistics:** They may not take everything into consideration such as the fact that some products are dropped along the way. **Page 99.**

■ **It isn't easy attracting IS professionals to Alaska** and remote locations. But it can be done. Managers who have to recruit staff to data centers far from the heart of New York and Los Angeles pitch such perks as the quality of life and the importance of the job. **Page 119.**

■ **It may be time to stop thinking of multimedia as something that runs on stand-alone PCs.** DEC and other vendors are looking for ways to bring large systems and networks into the arena. **Page 43.**

■ **On site this week:** Food products maker Nestle hopes to tie its varied E-mail systems together with its first companywide E-mail network. **Page 51.** An industry-standard Fiber Distributed Data Interface backbone runs through the new corporate headquarters at real estate company Ryland Group, carrying traffic generated by both PC LANs and proprietary minicomputers. **Page 51.** Providing common access to data on diverse systems at several independent business units may help Kaiser Permanente reduce system demand and improve decision-making. **Page 87.** Similar cross-platform access is behind a project at the American Stock Exchange. **Page 95.**

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Bundled DOS/Windows seeks to undercut OS/2

BY CHRISTOPHER LINDQUIST
CW STAFF

REDMOND, Wash. — Microsoft Corp. has announced an integrated MS-DOS/Windows 3.1 package aimed squarely at IBM's plans to ship OS/2 2.0 preinstalled on Personal System/2s.

The combined package, announced last week, will be sold to PS/2 resellers, who will then be able to install DOS and Windows on the machines by either deleting OS/2 automatically, deleting it manually or leaving it on the system so users can "dual boot" to either operating system.

IBM disagreed, stating that the combined package looks like a spin-control reaction to OS/2's sales, currently pegged at 200,000 by IBM. "I think that this announcement sounds like the company is very nervous about the exploding interest in OS/2," an IBM spokesman said.

But at least some IBM customers see the Microsoft plan as positive. "If [OS/2 2.0] was the only option I had, I wouldn't buy those machines," said Roy Gregory, manager of personal computing at Scrivner, Inc. in Oklahoma City.

Still other users said they prefer to let other companies find the bugs in both systems before having to buy either. "I really don't want either one [Windows 3.1 or OS/2 2.0] at this point," said Joseph Trickey, personal computer coordinator at Stratton-Cheeseman Management Co.

Microsoft IBM

The IBM-specific DOS/Windows package will be available to IBM resellers by the end of the month. It will have a retail price of $199.95, with a promotional price through 1992 of $149.95. A version for OEMs not selling IBM hardware will be available next month.

IBM recently announced that it would bundle OS/2 with PS/2 Models 56 and 57. The company also indicated that future PS/2s would ship with OS/2 instead of DOS.

Microsoft said it decided to sell the DOS/Windows combination after talking to resellers and users who did not want to be forced into using OS/2 2.0 on their machines. "This does give IBM customers a choice," said Brad Chase, group product manager for MS-DOS at Microsoft.

Resellers indicated that Microsoft will probably find some market for the DOS/Windows offering, although none were willing to predict how large that market might be.

While it is possible for users to run DOS and Windows 3.0 applications under OS/2, Windows 3.1-specific applications are not yet supported. Another problem for IBM is that the standard configuration for Models 56 and 57 includes only 4M bytes of memory. OS/2 2.0 will run in 4M bytes, but users and reviewers generally reported that 6M bytes is a more realistic environment.

Developers to get Oracle 7.0

BY JEAN S. BOZMAN
CW STAFF

REDWOOD CITY, Calif. — Oracle Corp. said last week that it would soon ship a "developer's release" of Oracle Version 7.0 to users and developers awaiting the formal announcement of the distributed database product.

Ken Jacobs, Oracle's vice president of relational database management system marketing, said the developer's release would be offered, free of charge, to licensed users of Oracle Version 6.0 who have paid maintenance fees.

Oracle is expected to formally announce Version 7.0 June 15 in New York.

The developer's copy has "all the features that will be available in the production release of Oracle Version 7.0," including full documentation and application development tools, according to Oracle. It will even include the special modules that will carry separate fees once Version 7.0 goes into production. Users said they were told Version 7.0 production copies will ship this fall.

Previously, some users had started developing applications using SQL*Forms 3.0 but could not activate Version 7.0 features. Now, according to Version 7.0 product manager Michael Kennedy, users can sample Version 7.0 without buying it.

The developer's release will be available only on the following platforms: Digital Equipment Corp.'s VAX/VMS, Sun Microsystems, Inc.'s SunOS, Hewlett-Packard Co.'s HP/UX, Sequent Computer Systems, Inc.'s Dynix/PTX and Pyramid Technology Corp.'s DC/OSX.

Apple to fire product barrage

Computer maker reveals plans for desktop, server and portable systems

BY JAMES DALY
CW STAFF

SAN JOSE, Calif. — Apple Computer, Inc. will release a barrage of new products this year ranging from powerful number-crunching workstations to slim portables, according to Chairman John Sculley.

Apple's Sculley *said the timing is right for the new releases*

While speaking to a gathering at the company's Worldwide Developers Conference held here last week, Sculley also said the rollout schedule will include a personal computer line with faster processors, the expansion of its PowerBook notebook PC family and the availability of more systems packaged with compact disc/read-only memory (CD-ROM) drives.

The first of the newcomers is scheduled to arrive today when Apple unveils the high-end Quadra 950, which will replace its current high-end Model 900. Apple officials said the machine, which is based on Motorola, Inc.'s 33-MHz 68040 chip, provides 30% higher performance than the Quadra 700 and 900. Prices start at $7,199 for a version sporting 8M bytes of random-access memory.

The second portion of Apple's one-two May introduction punch will occur on the 29th, when the Cupertino, Calif.-based company announces a lightweight executive organizer, code-named Newton, that is about the size of a thin videocassette. Priced at about $700, it will include software that can read printed notes and then automatically add an appointment to a calendar, dial a phone or send a fax, sources familiar with Apple's plans said.

Newton will network with other PCs via a built-in fax and data modem or a wireless infrared link that can send and receive data up to six feet away. Later models will add voice recognition. Newton will be available in early 1993, according to sources.

The remaining machines will begin trickling out later this year, including the company's first computers with a built-in CD-ROM drive. Such bundling is considered a necessary first step for Apple to move cleanly into the multimedia market.

"The time is right, and timing is everything in this business," Sculley told the crowd.

Sculley said the PowerBook line will be expanded to include enhanced versions of the Model 140 and Model 170 and a color PowerBook, perhaps as early as the first quarter of next year. He gave no mention of the low-end PowerBook 100, whose sales have been hurt by the lack of an internal floppy disk. But Senior Vice President Roger Heinen said the company is exploring different configurations of all the PowerBook models.

Apple will also add international language support to System 7.1, the next release of the Macintosh system software slated to ship this fall. The Wordscript technology will enable the computer to manipulate several languages.

HP to upgrade 3000, 9000 models

BY MARK HALPER
CW STAFF

PALO ALTO, Calif. — Hewlett-Packard Co. this week plans to extend its minicomputer line further into mainframe territory with redesigned four-processor systems expected to challenge IBM mainframes in transaction processing.

HP is adding the models to its proprietary HP 3000 line as well as to its Unix-based HP 9000 family. The introductions come just six months after HP first added three- and four-processor systems to the 3000 and 9000. The systems should be available by year's end. The company has slated an announcement for Wednesday but last week declined to comment on the planned introductions.

The new models, code-named Emerald, will employ a faster bus design that one source said will improve performance by 60% over the existing HP four-processor systems — the Model 3000 Series 980/400 on the proprietary side and the Model 9000 Series 870S/400 on the Unix side.

According to another source who asked not to be identified, HP will offer the new systems at about the same price as the existing four-processor models. Prices range from $260,000 to $945,000, depending on configuration.

It could not be learned if HP is phasing out the existing multiprocessor models, which top out in transaction processing performance ratings at 173 transactions per second.

"This would fit in with HP's plans to offer symmetric multiprocessing systems to improve transaction processing for data center applications," said Robert Herwick, an analyst at Hambrecht & Quist, Inc. in San Francisco.

> THE EMERALD models will employ a faster bus design that one source said will improve performance by 60%.

Users last week welcomed the prospect of higher performing machines.

"We run into limits on throughput," noted Rodger Lindquist, manager of informations services at Dreyers Brand Ice Cream, Inc. in Oakland, Calif. Dreyers uses a 3000 Series 960 as a host system to process deliveries by the company's 300 route trucks.

"This gives them a processor that will be competitive on a performance basis with IBM mainframes," said Stephen Levandowski, vice president of information resources at Levi Strauss, Inc., based in San Francisco.

Analysts noted that by moving up the performance curve, HP will hold onto and attract customers who may otherwise have selected other brands.

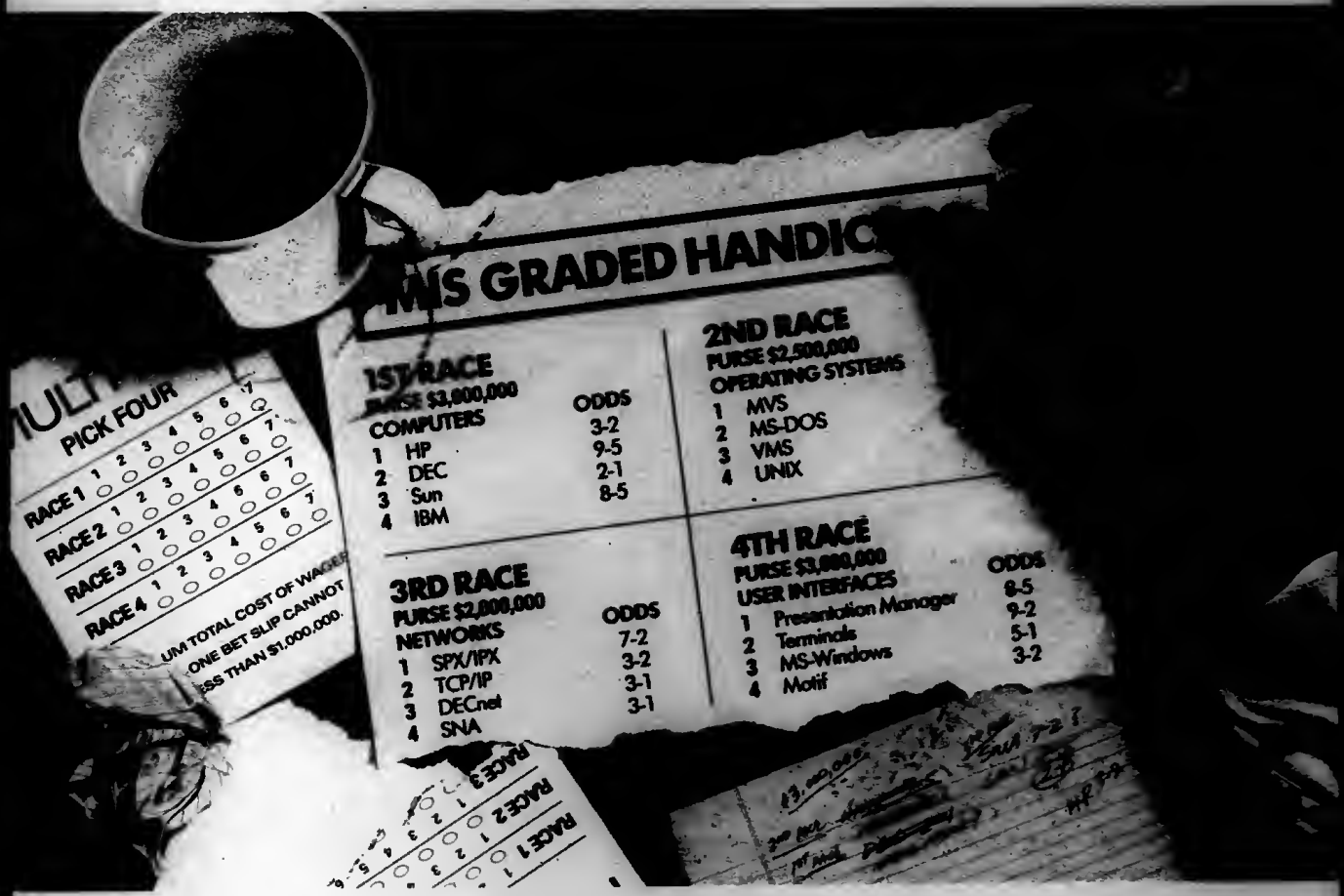
Base consumption

"They've got a base of customers who continue to consume more capacity," said John Jones, a San Francisco-based vice president at Salomon Brothers, Inc. "This clearly moves [HP] up to the low end of the big machines."

The new machines should also help HP continue to steal market share from Digital Equipment Corp., which goes head-to-head with HP in the minicomputer market with its VAX line, Jones said.

The Emerald models should also improve HP's stand in its slugfest with other vendors of high-performance systems, such as Sequent Computer Systems, Inc. and Pyramid Technology Corp., users and analysts noted.

Is This Your Idea Of How To Make A Critical Business Decision?



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NEWS SHORTS

Quorum tries to end run Apple

Quorum Software Systems has asked a federal court to rule that it has not infringed on any of Apple Computer, Inc.'a copyrights or patents. Quorum was locked out of Apple's Worldwide Developer's Conference last week after Apple complained that Latitude, Quorum's cross-platform compatibility tool for Macintosh applications, violates its copyrights on pull-down menus and Color QuickDraw. Apple also revoked Quorum's privileges as an Apple Certified Developer. Quorum said it used the Open Software Foundation's Motif and Open Look pull-down menus and Adobe Systems, Inc.'a Display Motif and SunSoft News for screen rendering.

Computer puts satellite out of reach

The space shuttle Endeavour crew's grueling bid to rescue a wayward satellite was prolonged over an hour last week when an on-board computer failed to compute the commands needed to move the shuttle close to the satellite. The shuttle made an additional Earth orbit while engineers worked on the problem. The crew ended up radioing voice commands to the shuttle based on commands from a backup computer on the ground.

Sun ships SNMP-based software

Sun Microsystems, Inc. announced SunNet Manager 2.0, the latest version of its Simple Network Management Protocol (SNMP)-based platform. It is said to be able to manage tens of thousands of network nodes and to support a distributed architecture in which multiple SNMP workstations can send selected alerts to a central system. Slated to ship in July, it is priced at $3,995. Sun said it will migrate SunNet Manager to Solaris 2.0 80X86, IBM RISC System/6000 and Hewlett-Packard Co. HP 9000 systems at an undisclosed date.

IBM reveals OS/2 sales figures

IBM officials last week said the firm hopes to sell at least 1 million copies of OS/2 2.0 this year. So far, IBM claims to have shipped about 200,000 shrink-wrapped copies of the software and electronically downloaded another 200,000 copies to customers. Some analysts said they think IBM can sell between 2 million and 4 million copies. IBM's Help Center has been swamped with calls — mostly regarding installation — and IBM said the overloaded support system is just catching up.

CA wins withdrawal of software

Computer Associates International, Inc. and Application Development Technologies, Inc. (ADT), a Dallas-based software developer, have settled a 16-month battle over ADT's AD/TEC-SYS package, which is used to estimate software development costs. Originally, CA and co-plaintiff Howard Rubin Associates, Inc. sued ADT for misappropriating trade secrets of CA's CA-Estimax software product and Rubin's RA-Metrics package. The settlement calls for ADT to withdraw AD/TEC-SYS from the market. ADT President David Bryan said he could not afford protracted litigation against CA.

Short takes

Detroit Edison Co., a $3.5 billion utility, said it will spend about $1 million to buy 367 **Grid Systems Corp.** GridPad pen computers. The utility said it expects to save $1.6 million in operating expenses in the first year. . . . Stephen C. Daffron, former vice president of information services at **The New York Mercantile Exchange**, has been promoted to senior vice president of strategic planning and information services. . . . **IBM** shipped AIX NetView/6000, a network management workstation based on SNMP, last week, a month and a half early. . . . **Revenue Canada Taxation** has installed the first **Hitachi Ltd.** EX 520 mainframe at its Ottawa data center. . . . **Cypress Semiconductor Corp.** unveiled its second-generation HyperSPARC processor, code-named Pinnacle. The high-performance, superscalar reduced instruction set computing processor is endorsed by **Sun and SPARC International, Inc.** . . . **Digital Equipment Corp.** cut Fiber Distributed Data Interface prices up to 59%.

More news shorts on page 16

UPS to deploy wireless network

BY ELLIS BOOKER
CW STAFF

MAHWAH, N.J. — United Parcel Service, Inc. will invest $150 million to deploy a nationwide, data-over-cellular system for its vehicles by early 1993, the shipping company said last week.

The addition of a wireless capability, UPS said, will enable it to track deliveries for all air and some ground parcels throughout the day. This information is collected nightly and uploaded into a mainframe in New Jersey and is available to customers the following morning.

Analysts said UPS' sizable investment is sure to raise the profile of data-over-cellular technology. "It's a significant commitment by a major communications user, and it lends a lot of credibility to the use of cellular for data services," said Cliff Bean, director of the mobile telecommunications consulting practice at Arthur D. Little, Inc. (ADL) in Cambridge, Mass.

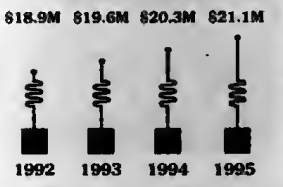
According to ADL estimates, within five years there will be 5 million to 7 million users of mobile data services of all types, including those based on public cellular networks. Last month, nine leading cellular carriers announced the summer trial of CelluPlan II, an IBM technology used for sending packet data over unused channels in circuit-switched cellular voice networks

But UPS could not wait for commercial availability of CelluPlan II-type systems. "We think CelluPlan II is very promising. . . . It's just too late for us," said Paul Heller, UPS' systems manager of mobile networks.

UPS had evaluated other wireless options, "but the thing that gave cellular the edge was its extensive geographic coverage," Heller said.

Tuning the frequency

The North American cellular radio services market is expected to grow 10% during the next three years



Source: The Insight Research Corp. CW Chart: Michael Siggins

The remaining problem was that each cellular company had a different approach for transmitting data over its own network. To overcome this and provide nationwide consistency, UPS developed its own communications protocols.

UPS will use cellular networks from McCaw Cellular Communications, Inc., GTE Mobile Communications, PacTel Cellular and Southwestern Bell Mobile Systems. The four carriers have also formed an alliance to provide UPS with unified billing and network management, UPS said.

The cellular networks will tie the UPS trucks into UPSnet, a 40-node, private X.25 data network UPS completed last year.

Heller declined to specify the cost per transaction over the cellular networks. He noted, however, that because the cellular switches will be directly linked to UPS net nodes, call completions will be in the 15-sec. range, and UPS will not be billed by the cellular carriers on a per-minute basis.

In the vehicles, UPS will deploy cellular radio communication controllers from Motorola, Inc. The controllers will read information from the electronic order-entry clipboards already carried by UPS delivery personnel. Transactions will be sent from the vehicles over local cellular networks and patched into UPSnet.

UPS customers will pay an additional 75 cents per package to get the tracking service for ground delivery. Tracking of air parcels will be done for no additional fee.

USL to bolster Unix by filling security, fault-recovery gaps

BY JIM NASH
CW STAFF

SUMMIT, N.J. — Fault recovery, security and graphical interface — features now absent from the core Unix operating system — will be bundled with Unix System V Release 4.2 when it is introduced next month.

Roel Pieper, Unix System Laboratories, Inc. (USL) president and chief executive officer, last week confirmed that the Unix file system — umbrella software that administers the Unix operating system — will be replaced with a file system from Veritas Software Corp. that includes the new features.

Early beneficiaries are likely to be users of current Unix versions who now face delays and data loss when rebooting their systems after the crash.

Unix users are prone to losing more files than users of other systems because they are more likely to have multiple applications running at any given time. Any files being accessed, opened or closed can be lost with the current Unix file system because they are in transition, with no declared "destination," Veritas President Mark Leslie said.

Also likely to benefit will be those who adopt Unixware, a product of Univel — a joint venture of Novell, Inc. and USL — that could ship as early as August. Built around Unix System V Release 4.2, Unixware is a Unix version tailored specifically for NetWare.

Long-term association

Leslie said his firm and USL have had a long-standing relationship in which Veritas concentrated on development of a file system and USL made room for it on Unix. To date, Unix has several software slots open for multiple file systems, but it is unclear if the slots will remain.

The newest file system uses transaction-processing technology to reduce the chance of losing files when a Unix workstation crashes and to minimize the time it takes for a workstation to recover from a crash, he said.

Specifically, the Journaling File System notes what action is intended for each active file before the action is taken. If the workstation crashes, it immediately knows what to do with the files when it recovers. All changes saved before a crash can be recovered.

As a result, recovery time is reduced because the workstation does not have to check every file to see if it was active before the crash. What could take anywhere from minutes to hours takes two or three seconds with Veritas' file system without adding overhead, Leslie said.

USL will also secure the bundled file system, something it does not do now with file systems. It will put it off-limits to users short of managers in order to guard against its accidental deletion and tampering, Pieper said.

Greater fault recovery is always welcome, said Randy Mayhew, manager of the University of Tennessee's Unix systems group. Mayhew's department has several Unix machines, including one with 10G bytes of storage on its hard disk that is being upgraded to 18G bytes. "I'd hate to fish through 18 gig" for files lost in a crash, even with expedited file-check capabilities available with Unix, he said.

Europcar takes a chance on Perot's mainframe-to-Unix systems overhaul

BY MARK HALPER
CW STAFF

BOULOGNE, France — The information systems chief of Europe's leading rental car company conceded that his 10-year megabuck services pact with Perot Systems Corp. is risky, but he said it is a chance worth taking, given the patchwork state of Europcar International's data processing operations.

The recently disclosed $500 million deal calls for Perot to move Europcar off its antiquated IBM-based batch processing system and onto a real-time distributed processing system within two years, after which time Perot will run the company's information systems.

The contract is risky for a number of reasons. First, it is Perot's maiden voyage into European information technology services. On top of that, Perot has opted against a tried-and-true, mainframe-style, on-line transaction processing system in favor of a Unix system, which Perot President Pat Horner noted will adapt more readily to the myriad of workstations already in place in Europcar's nine-country orbit.

Speedy service

According to Robert Verasdonck, Europcar's corporate director of IS, Europcar did not specify Unix in its request for a proposal. "I asked for fast change with high functionality. I asked for business results, not technology," the IS chief said.

Verasdonck said Perot officials persuaded him that a Unix solution would meet Europcar's requirements, primarily by demonstrating the fourth-generation language tools they will use to develop the system. They also showed him reservation software that their company had developed for Pentastar Services, Inc., the Tulsa, Okla.-based Chrysler car rental subsidiary that owns Dollar Rent A Car, Inc. and Thrifty Rent-A-Car System, Inc.

Verasdonck said he chose Perot over a field of finalists that included Electronic Data Systems Corp., IBM, Cap Gemini Sogeti and Britain's Sema Group. "The key requirement was the functionality had to be delivered and installed within 24 months," Verasdonck said.

The need for quick action was clear because running a rental car operation on a batch processing system in the 1990s is the technological equivalent of renting Ramblers to tourists traveling the continent's highways. Information has to be downloaded from the firm's 3090 mainframe outside of Paris onto a mix of minicomputers in the nine countries in which Europcar owns 1,000 rental outlets.

Furthermore, an additional 1,000 franchise operations are not computerized at all, Verasdonck noted.

And because Europcar has grown rapidly during the last decade through a number of acquisitions, those minicomputers and the software that runs on them are as varied as the European cultural mix. Hardware includes a mishmash of NCR Corp., Siemens Nixdorf Information Systems, Inc., IBM and other brands.

Perot is developing software called GreenWay that will run on a central Unix host and provide reservation, agreement and billing services. Europcar has three separate programs to handle those functions.

Perot is in the process of selecting both Unix hardware and software, a selection expected to be made by August.

Unlikely partners

Some hatchets are slated for burial as Perot Systems sets up a new, distributed Unix-based reservation system for Europcar International.

Europcar is a marketing partner of National Car Rental System, Inc., which uses Perot rival EDS as its outsourcing provider. EDS, which owns National's reservation software, will soon work with Perot and Europcar to connect, via IBM's Systems Network Architecture, the National system with Europcar's forthcoming GreenWay system. The GreenWay system will reside on a Unix computer in France; the National system is a 3090 mainframe at an EDS data processing center.

The systems will share reservation and customer service information. "They don't have to bury the hatchet; they just have to do what we tell them to do," said Jack Livingston, National's chief information officer.

MARK HALPER

IBM elaborates on SystemView

APIs needed to improve integration flexibility for users, analysts say

BY ELISABETH HORWITT
CW STAFF

NEW YORK — IBM's SystemView strategy will deliver full-function, integrated systems management for IBM Application System/400s and OS/2-based desktops a lot sooner than it will for the mainframe data center, an IBM spokesman said at a briefing last week.

Nevertheless, some information systems departments currently faced with massive data center consolidation efforts are choosing SystemView — gaps, lumps and all — because they see it as the only choice in town.

First announced in the fall of 1990, SystemView is an umbrella concept for integrating management of operations, performance, problems and changes across the full range of IBM mainframe, midrange and low-end systems. Central to the concept is a set of interfaces and specifications that, if followed, permit various network and system management applications to share information, respond to a common set of automated applications and interact with users via a common graphical user interface (GUI).

Current details

So far, IBM has defined the following SystemView specifications: Common User Access as the GUI, SQL as a common querying language, and NetView tools for building automated applications. IBM has made enough progress with SystemView to encourage more than one major IBM shop to stake its data center strategy on the platform.

For example, Chemical Bank, based here, perceives the platform "as the environment that promises the broadest scope for managing change, problems, systems and applications," said James Mayer, a senior vice president of information and technology management. However, the bank does not expect SystemView to provide a full solution for five or six years, he added.

In addition, Bankers Trust Co. has just finished up a major data center re-engineering effort that integrates IBM and Candle Corp. system management tools under the SystemView umbrella (see story below). "I think IBM is just scratching the surface with SystemView, but I think we'll follow their strategy," said Warren E. Ousley, senior vice president of Bankers Trust.

What SystemView needs most now is application programming interfaces (API) that would allow users to integrate whatever third-party and IBM data center applications they want under the SystemView umbrella, David Passmore, a vice president at Gartner Group, Inc. in Stamford, Conn., said.

Without these APIs, "SystemView is just a marketing umbrella," Passmore said. Also missing is support for key industry standards, such as the Open Software Foundation's (OSF) Distributed Management Environment, he added.

IBM is taking this long to deliver SystemView for the data center because of the effort needed to integrate "hundreds of [IBM and third-party] data center management products already out there," said Bill Warner, IBM's network systems director.

In contrast, IBM expects to introduce Distributed Systems Manager, a SystemView-compliant, OS/2 local-area network systems management platform, by late 1992 or early 1993, an IBM spokesman said. Current OS/2 management products, such as IBM's System Performance/2, will conform to SystemView by 1993, he added.

Team effort

A SystemView platform designed to manage distributed OS/400s is under joint development by IBM and Candle. The platform will take advantage of systems management utilities that were built into the midrange operating system, another IBM spokesman said.

Although no time frame was mentioned, IBM indicated that the product will be out soon.

IBM recently committed to converging SystemView's GUI with OSF's Motif and supporting the OSF Consolidated Management API that enables the same application to manage devices via the International Standard Organization's (ISO) Common Management Information Protocol or Simple Network Management Protocol, Warner said. IBM's OS/2 SystemView product will support the Consolidated Management API, he added.

IBM is also developing a SystemView object-oriented data structure based on ISO protocols. IBM introduced initial object definitions last year and plans to introduce more this year.

The Blue view

IBM's System View has begun to solidify — in patches.

IBM products conforming to System View:

- **Available now:** NetView Graphic Monitor Facility, SAA Delivery Manager, Workstation Data Save Facility/VM, LAN Network Manager, Site Manager Services.
- **To come:** MVS data center management applications (no release date), AS/400 management utilities (no release date), OS/2 systems management (by early 1993).

Third-party products:

- **Available now:** Candle CL, AF and Omegamon products (Candle DB to come); Bachman Information Systems, Inc. DBA.
- **To come:** Products from Goal Systems International, Inc., Information Retrieval Cos., Platinum Technology, Inc. (no release date).

Firm banks on IBM-Candle link

Bankers Trust is perhaps the first major user to bet its data center re-engineering strategy on third-party support of IBM's SystemView platform.

The bank has spent the past year developing corporatewide data center automation and integrated management, using a combination of IBM products such as NetView and Candle's Omegacenter suite of enterprise management applications, according to Warren E. Ousley, a senior vice president at the bank.

Benefits the bank has realized so far from the re-engineering effort include the elimination of 86% of system management messages that previously went to human operators and automation of approximately 60% of the bank's CICS applications, Ousley said.

The bank has been able to cut its IS staff by 20% since the effort began in April 1991, he added. In general, the project has helped Bankers Trust achieve better systems availability, faster recovery and faster product development, Ousley said.

Candle recently started shipping a SystemView-compliant version of Omegacenter, as well as a link between its products and NetView.

Candle's Omegamon provides the monitoring and management of IBM environments such as CICS, DB2 and Information Management System, alerting NetView when an alarm threshold is passed, Ousley said.

NetView was used to generate applications that automatically respond to a network alert, reboot a system or start a backup job at a set time, Ousley said.

SystemView also enables an operator to perform remote operations management from either an IBM NetView or a Candle AF Remote workstation, Ousley said.

IS had to generate some 11,000 lines of internal code to handle business-specific application needs not covered by the vendors' software, Ousley said. This is a small amount, given the scope of the project, he added.

The bank is only now starting an evaluation of how it can "filter down data center disciplines to provide disaster recovery, backup and asset management on its LANs," Ousley said.

DB2 users seek advice on how to distribute databases

BY JOHANNA AMBROSIO
CW STAFF

NEW YORK — Two years ago, customers came to a DB2 user group to complain about performance problems with IBM's premier database management system. This year they came here to talk about their production applications and to share tips about how to distribute data effectively and surmount cultural barriers.

Several users attending the International DB2 Users Group (IDUG) meeting, which last week attracted 1,400 people, shared tales of huge DB2 applications — distributed and not. Among them were Twentieth Century Services, Inc. and United Parcel Service, Inc.

Kansas City, Mo.-based Twentieth Century, a mutual fund company with 1,200 employees, has the vast majority of its mission-critical applications in DB2. UPS, based in Mahwah, N.J., has a 1.1T-byte database implemented in both DB2 and IMS. It is also distributing data to OS/2 servers, which are expected to number more than 200 by next year.

Need the whole package

Distributing data between DB2 and OS/2 is a "nontrivial" task, according to Mark Buckingham, a staff member in the data management group at UPS. "A number of disciplines need to come together. Strong PC and mainframe skills are a must; the most important skills are the communications ones," he said.

Howard Fosdick, an independent consultant in Villa Park, Ill., and IDUG's president, said, "There aren't that many user experiences yet with distributed [databases]. Implementation is a long process."

The first version of DB2 that allows users to choose to distribute, Version 2.3, just became generally available in March.

There are different techniques among the users who are taking the distributed route. For distributing data among different mainframe-based DB2 systems, American Express Travel Related Services Co. in Phoenix is using an IBM technique called Distributed Snapshot. Aetna Life & Casualty Co. wrote its own interface between OS/2 and DB2 for a distributed financial application.

Perhaps even more challenging than the technical issues, the attendees said, are the cultural ones. One database administrator who has implemented a distributed database at a transportation concern said, "The biggest problem is getting these sets of people to talk to one another. DB2 and OS/2 work differently, and then you throw the communications people in and it just gets worse."

Some users have found that bridging the old with the new works best. At the University of Tennessee, applications can access both IMS and DB2 to allow the university to choose whichever database architecture works best for a given function.

Performance is still on users' minds, but now it is an issue of tweaking rather than one of hitting walls. For most applications, users said, DB2's transaction rate is now satisfactory. Instead, the task is to save as many cycles as possible by using software tools and other measures.

"DB2's certainly got a lot of functionality, but it also requires more cycles," said Ron Gottschalk, a consultant at National Mutual Life in Victoria, Australia. "Cost containment is an extremely important issue to management."

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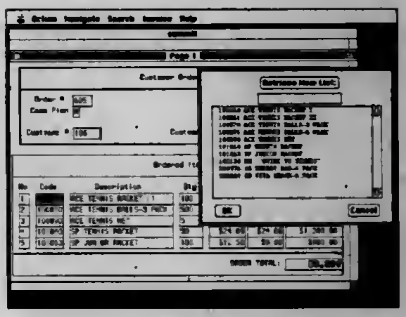

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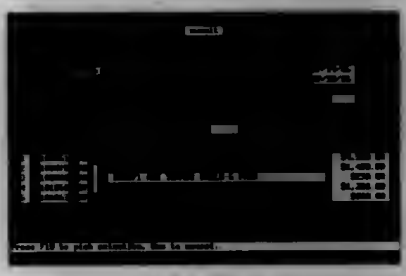
Motif



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Lotus set to ship imaging software for Notes

BY ROSEMARY HAMILTON
CW STAFF

CAMBRIDGE, Mass. — Lotus Development Corp. is gearing up to release imaging software for its Notes workgroup platform early next month.

Craig Goldman, chief information officer at The Chase Manhattan Bank NA, a beta-test site for the imaging software, said it will bring the bank "a step forward in achieving our dream of multimedia Notes."

"There's a certain amount of data we need that is still not in electronic form," Goldman said. "By imaging it and making it available, we have the capability to provide virtually all the information we need."

The product, tentatively called Lotus Notes: Document Imaging, is the result of an April 1991 agreement with the Desktop Document Imaging Group at Eastman Kodak Co. Lotus will sell it as a companion product to Notes.

"The image-enabled Notes is really the first example of what will turn out to be many Notes-based applications," said Ann Palermo, director of workgroup and messaging research at International Data Corp. in Framingham, Mass.

Chuck Olson, a Lotus product manager, said that while the company has targeted early next month as one of several announcement dates for the image software, "we've been telling customers end of June for the shipment."

Lotus Notes: Document Imaging will handle three major components of the imaging process: interfaces to common input devices, such as scanners; viewing; and storage.

Other functions will be offered as separate add-on pieces. For example, a fax input program, which would allow faxes to be sent directly to Notes and viewed as a document, will be sold as a separate fax gateway.

A second add-on is an optical character-recognition feature that allows users to transfer a document to a standard Notes file format. This would be useful should users wish to search the document. Current Notes search techniques, as well as the upcoming text search-and-retrieval function that Lotus is working on with Verity, Inc., cannot search image documents.

OS/2 gets in on the act

The core imaging software will be sold on a per-user license fee basis in the $200 to $400 range. The initial release will run on an IBM OS/2 server with a Microsoft Corp. Windows client. An OS/2 client is planned for a fall delivery and will likely be part of the Notes Version 3 announcement, Olson said.

The software will run as a Notes application and can be loaded on the Notes server or on its own server, if it is a large imaging application, Olson said. The software was designed with the Notes user interface and will eventually include such common features as the Lotus SmartIcons, which will be included in Notes Version 3.

A key component is storage management, which Kodak developed and is sharing with Novell, Inc., IBM and Lotus, said Michael Loria, a program manager at Kodak's Desktop Document Imaging Group.

The software allows users to set up parameters that would automatically assign the image data to different storage devices, depending on how often the data is used.

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Rising star on move

Lotus last week appointed Consulting Senior Vice President June Rokoff as a co-manager of its development group, making her a peer to John Landry, the company's senior vice president of development and chief technology officer.

Rokoff, a rising star at the spreadsheet maker, was given the title of senior vice president of development. She will handle day-to-day operational issues, while Landry is responsible for strategic planning.

Industry analysts pegged the change as a positive step, noting that Landry is more suited to "the big picture" and playing the front man, whereas Rokoff is known for handling the nuts-and-bolts issues well. For instance, she was credited with helping turn around the troubled 1-2-3 Release 3.0 project.

The management change "gives John the freedom to do the things he was hired to do," said Terence Quinn, senior technology analyst at Kidder, Peabody & Co.

Coinciding with the executive restructuring, the company merged its pen-based application group with the main development staff. This is the latest step in its plan to streamline development and share more technologies across product lines.

ROSEMARY HAMILTON

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HP color boxes fall under $10K

BY MARYFRAN JOHNSON
CW STAFF

PALO ALTO, Calif. — Hewlett-Packard Co. last week dropped the entry point to its color workstations below the $10,000 mark with the introduction of two new models in the HP/Apollo 9000 Model 700 line.

Company officials said new high-end workstations and servers, based on the Precision Architecture-RISC 7100 chip, will debut soon. They declined to give further details, however.

The Model 705 color workstations, with starting prices of $8,990 and $9,990 for diskless models with 16- or 19-in. screens, will be available next month. The low-end color workstations have "the best price/performance of any system in their class," said Ted Krum, an analyst at D. H. Brown Associates, Inc.

"These are not the cheapest boxes in town," Krum said. "But for users taking CPU and graphics performance into account, the Model 705 is a better deal" than comparable systems from Digital Equipment Corp., IBM or Sun Microsystems, Inc.

Krum and other analysts lauded HP's high-performance graphics capabilities, increasingly in demand among customers using color applications.

The entry-level Model 705 was previously available only in gray scale, at prices beginning at $4,990 for a diskless system. The Model 705 color system is $2,400 cheaper than the previous low-end color Model 710 — a 21% drop in price for an entry-level color workstation. HP also dropped the price of its 50-SPECmark Model 710 color workstation by $1,500 to $12,590.

Color by numbers

Configurations of HP Series 9000 Model 705 color workstations include:

Display	16 in.	16 in.	19 in.
Memory	16M bytes	16M bytes	16M bytes
Mass storage	Diskless	420M bytes	420M bytes
Price	$8,990	$11,490	$12,490
Availability	June	June	June

CW Chart: Michael Siggins

Sponsors take serious look at role of the OSF

CONTINUED FROM PAGE 1

"OSF needs to decide where their value-added is to the whole process of standards-based computing," said Catherine Howells, manager of external standards at The Boeing Co. in Seattle.

These days, OSF President David Tory is busy mapping out a different direction, shifting the OSF away from in-house engineering work, such as OSF/1 development, toward a broader management role for software technologies created elsewhere [CW, May 11].

Other users said the OSF's ability to get competing vendors to agree on industry standards was the greatest benefit for them. "I think OSF would have more credibility on the standards side if they get out of the operating system business," said Bill Conley, manager of information technology services at Loral Aerospace Corp. in Newport Beach, Calif.

While IBM and HP officials said they are staunchly committed to adopting OSF technologies, analysts noted that both firms have backed away from their plans to fully implement the OSF/1 operating system. Rather, IBM and HP have opted to stay with their own, more stable Unix variants in the absence of a production-quality OSF/1.

Although IBM had once planned to run OSF/1 on its Personal System/2 line, today only OSF/1 commands and libraries are integrated in the AIX/ESA mainframe operating system kernel.

HP's commitment is the most tenuous of the Big Three firms, with only an unsupported "technology release" of OSF/1 available. Several analysts said they believe HP will be the first "defector" to USL's Unix System V Release 4 in the desktop "Destiny" version.

"We certainly are in a cooperative mood toward the whole open systems community," said Jim Bell, director of integrated information management at HP. "At this point in time, we have not yet even evaluated or committed to offer our customers any [Unix System] V.4 products."

As the vendor most committed to OSF/1 as its "Unix for the '90s," DEC is spending $75 million a year getting DEC/OSF/1 ready to run on its upcoming line of Alpha systems, Stone said. But plans to put OSF/1 on its own Unix-based DECstation line are now on hold, Stone said last week (see story above).

"We're the only company putting all its future Unix effort on OSF/1. We want OSF to continue as a viable part of the definition of open systems," Stone said. One obvious goal for the OSF, he added, is to do a better job developing specifications and testing compliance to those specs. "They have been spending more time than they should on productization," he said.

The nonprofit, vendor-supported OSF must win another round of funding from its sponsors by mid-1993. It is still unable to support itself on royalties from the Motif graphical user interface or OSF/1, Stone noted. However, he and other sponsors stressed that the OSF is not in danger of losing their support.

"IBM is very happy with our relationship with OSF and with its open technology selection process," said Donna Van Fleet, director of programming at IBM's Personal Systems Group. "They're focusing on the distributed environment right now, which is exactly what the industry and our customers want."

"We can be viewed as the prime contractor," Tory said, referring to oversight and integration work on software technologies such as its Distributed Computing Environment (DCE) and Distributed Management Environment (DME).

For users such as Duane Elms, program manager of technical computing at General Electric Co. in Fairfield, Conn., OSF/1 has become a moot point. He wants Unix system management tools and distributed computing utilities.

"Why on earth should I subject my customers to a transition from a Unix they've spent years putting together to one that's brand new, immature and buggy?" Elms asked.

Some analysts are ready to write off OSF as an organization whose time has come and gone. Others applaud its refocusing on critical software for distributed computing.

"OSF is absolutely right to put their resources into DCE and DME," said Judith Hurwitz, president of Hurwitz Consulting Group in Newton, Mass. "When you're a small company with limited resources, you've got to pick your battles and your products carefully."

Consortium chronology

Open Software Foundation milestones

May 1988	OSF founded
[redacted]	Announces availability of Motif 1.0
July 1990	Issues request for Distributed Management Environment (DME) technology
[redacted]	OSF/1.0 shipped
September 1991	Announces availability of Distributed Computing Environment
[redacted]	Selects technology for DME
May 1992	First code release for DME and Motif 1.2
[redacted]	Commercial release of OSF/1.1

CW Chart: Janell Genovese

Opting for Ultrix, not OSF/1

Citing a "tremendous swing in the customer base" in favor of its high-performance Alpha chip, a DEC executive said last week there is "no commitment" to put the DEC/OSF/1 operating system on the next generation of DECstations and DECsystems.

Those machines will be based on Mips Computer Systems, Inc.'s R4000 chip, which appears to be falling from grace as Alpha ascends. "Customer anticipation of the R4000 chip was that it would be earlier and more competitive," said David Stone, vice president of DEC's software product group. "Why not get a whole batch more performance with Alpha?"

So instead of DEC/OSF/1, customers will get a new version of Ultrix. Some may balk at the switch. "I was looking for OSF/1 to fix some of my Ultrix problems," said Homer Hoe, information systems manager at Tenneco Minerals Co. in Denver.

MARYFRAN JOHNSON

Transcontinental journey

The OSF last week changed the target market of Architecture-Neutral Distribution Format (ANDF) — its most ambitious and complicated set of software tools — from the American to the European computer industry.

ANDF reportedly enables a single version of an application to run on different hardware platforms. Citing a lack of "general market acceptance" needed in the U.S. to meet a previously planned early 1993 introduction date, the OSF said ANDF development will be moved to its Research Institute in Grenoble, France.

The European Community's Esprit project has pledged $12 million to the OSF for joint development work on the ANDF technology. Under a separate contract, a U.S. government research agency will also work with the OSF on ANDF development.

A news item in *Computerworld* last week erroneously reported that Esprit would take over the ANDF project, but the effort will actually be a collaboration with the OSF.

While the notion of software applications running on multiple hardware platforms is a fond dream of end users, U.S. systems vendors effectively squelched the project, industry analysts said.

"It's not a technology problem. It's industry politics," said Judith Hurwitz, president of Hurwitz Consulting Group in Newton, Mass.

MARYFRAN JOHNSON

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IBM plots meaner, leaner PC strategy

BY CAROL HILDEBRAND
CW STAFF

NEW YORK — IBM's personal computer brass attempted to drive home the company's "micro" vision last week, outlining hardware directions, new distribution plans and a strong OS/2 push.

James A. Cannavino, general manager of IBM's Personal Systems Division, hammered home the message that today's IBM is a leaner, more aggressive PC competitor since the computing giant broke into smaller, more autonomous operating units.

The immediate future of the company's Personal System/1 and PS/2 lines reflects the current competitive climate in the PC industry. Cannavino detailed plans to produce new product families on a yearly basis, while also offering frequent, rapid refreshes within families and a full family in each line.

For example, he said the company expects to add an Intel Corp. I486 machine to its low-end PS/1 line as it broadens that line into a family [CW, May 11].

Also on the docket appears to be a third separate family of computers. The nascent line would serve to fill IBM's direct marketing needs, Cannavino intimated. He added that selling clones is not an IBM imperative (see story page 1).

John Marsh

IBM's Cannavino *doesn't envision Big Blue clones*

"An IBM salesman armed with a clone is not something we envision," Cannavino said, adding that IBM's taking an equity stake in a clone maker is much more realistic.

Robert Carberry, assistant general manager of technology at the Personal Systems Division, presented a long-term vision with a heavy emphasis on collaborative and mobile computing.

Taligent, Kaleida and the PowerPC initiative, IBM's three-pronged venture with Apple Computer, Inc., will form an additional direction, although the company will not dump Intel-based lines in favor of the reduced instruction set computing-based PowerPC technology.

OS/2 garnered a majority of attention on the podium as executives detailed its present status and future directions.

Although the jury is still out on the fate of the recharged IBM, analysts said it would be foolish to count the deeply resourced company out. "IBM has more pieces of a whole vision than anybody else," said Richard Zwetchkenbaum, an analyst at International Data Corp. in Framingham, Mass. "Zeos, ALR and the like don't have a vision of collaborative computing. They don't have the Chicago Mercantile Exchange doing a pilot program of their pen systems," he said, referring to IBM's still-powerful technological reach.

Senior writer Michael Fitzgerald contributed to this report.

Users ambivalent about micro leaders' low-end focus

CONTINUED FROM PAGE 1

lines that will be distinguished mainly by availability in nontraditional distribution channels. The lines will offer products ranging from 386SX boxes to full-fledged Intel I486 machines.

Users expressed mixed feelings about whether they want to see mud from the low-end trail on the shoes of IBM and Compaq.

"I'm not sure that I'd want my premier vendor mucking around trying to sell low-end machines through the mail," said Leilani Allen, senior vice president of information technology at Sears Mortgage Corp. in Riverwoods, Ill.

Others said they will look to see if dropping prices extend to the high end as well. "We won't buy vast quantities of entry-level 386s just because they're under $1,800. Our purchasing is typically driven by software needs and usage," said Ronan McGrath, vice president of information systems and accounting at Canadian National Railways in Montreal.

Quality concerns

Still other users said they are worried that as margins on the boxes go down, quality could also suffer if corners are cut to save money.

"I'm interested [in low-price systems] if there is consistency in the parts that they put in the equipment," said Roy Gregory, manager of personal computing at Scrivner, Inc., a $6 billion distributor in Oklahoma City. "Some of the concerns I have with other low-end vendors is they'll put in the lowest cost part of the month for a diskette drive, for instance."

Some clone users, for example, have found that Microsoft Corp.'s Windows 3.1 and IBM's OS/2 will not run on their machines [CW, May 4].

However, both vendors have repeatedly denied that their entry into the low-end market will signal a drop in quality.

Still, low-cost entries appeal to some users. Compaq's upcoming entry-level, 25-MHz 386SXs are expected to retail for about $999, and some major users have been told they will be able to get systems for as little as $700 each. This could win over such cash-strapped customers as Ben L. Berry, manager of computer services at Hughes Aircraft Co. in Los Angeles.

Hughes handles most PC expenditures through expense accounting, which limits the firm to $1,500 per CPU. Given this constraint, Berry said he would be very interested in low-cost, first-tier machines if they can come within $200 to $300 of the clones.

IBM and Compaq's sharply depressed market shares have prompted them to boost their waning presence in the low end of the desktop market. But the high-volume, low-end arena is also marked by ruthless price wars and anorexic margins.

For example, ARS/Workstation Laboratories, a consultancy in Irving, Texas, estimates a 65% to 75% cost/price ratio for the average 386SX machine.

It's in the mail

Officials at both companies said they are responding to demand from customers who no longer wish to buy through the dealer channel. IBM has acknowledged talking to mail-order vendors, including Northgate Computer Systems, Inc. But at a briefing last week, IBM indicated that although it is observing the market, the Northgate reports were premature.

IBM recently embarked on its first mail-order sorties, offering entry-level Personal System/2s with a monitor that can be ordered via a toll-free telephone number [CW May 4]. Its pricing appears in line with other direct marketers such as Dell Computer Corp.

Both IBM and Compaq have restructured, in part to compete more effectively on price. Last week, IBM's James A. Cannavino, general manager of its Personal Systems Division, said the restructuring requires his unit to provide a 10% return on assets. If IBM can achieve rapid, high-volume turnover on the low end, Cannavino said, he will meet his business goals for the low end.

Houston-based Compaq decided to engineer its own low-cost PC lines, including both the DeskPro and the forthcoming entry-level and midrange families (see story this page) to exploit economies of scale.

Changing colors

Compaq will change hats and may lose its spurs when it appears in public as a maker of low-cost PCs for the first time on June 15, sources close to the company said. The company is expected to introduce two lines of PCs, one for cost-conscious users, the other taking the middle of the road.

The entry-level line, expected to start at $999, will feature two models based on the 25-MHz 386SX chip from Intel and a 33-MHz 80386DX. These machines will not be upgradable but will allow users to add memory.

The midrange line, expected to replace Compaq's existing N line, will be processor-upgradable but will not have the modularity of its existing Compaq M series. The four members of the new family will use a 25-MHz and a 33-MHz 386, a 25-MHz 486SX and a 33-MHz I486. There are also plans for a notebook built with some components from Citizen Watch Co. in Tokyo that will use the 386SX chip and cost under $1,200.

MICHAEL FITZGERALD

TI joins CPU fray, Intel cuts prices

BY MICHAEL FITZGERALD
CW STAFF

DALLAS — Texas Instruments, Inc. entered the Intel-compatible microprocessor business last week without an immediate lawsuit from Intel Corp. However, Intel fired a warning shot at all its competitors by cutting prices up to 58% on its I486SX microprocessors.

Intel's price cuts and the addition of another competitor in the chip market means users can expect meaningful declines in systems price tags.

The exact impact is hard to forecast, however, because processors make up only a small percentage of overall system costs, which vary depending on configuration, observers said.

TI's latest foray into microprocessors begins with a cross-licensing agreement with Cyrix Corp. TI will both manufacture Cyrix's CX486SLC chip, an 80386/486 hybrid, and market the chip as its own under the name TI486SLC. Eventually, TI expects to build a derivative of the chip that it called a "semicomputer" — or a microprocessor with built-in system logic and peripheral functions, such as graphics controllers and networking, according to Tom Engibous, senior vice president at TI's Semiconductor Group.

Engibous added that TI has made it a strategic imperative to supply every component needed in a personal computer and that this was the last piece. He said TI has already shipped samples to potential customers and expects to be in volume production by September.

A spokesman at Advanced Micro Devices, Inc. (AMD) said AMD expects to be shipping its full-fledged 486 clones by the time TI enters the market.

Tom Brightman, Cyrix's co-founder and vice president, said the pact will "garner market acceptance for our product." TI refused to comment on market expectations.

Target practice?

Intel had no comment on whether it would add TI's name to its list of legal targets. Intel has sued Cyrix as well as Chips and Technologies, Inc. for patent violations involving X86 chips. TI has joined the Chips and Technologies countersuit.

Intel cut prices on its 25-MHz 486SX to $119 each in lots of 1,000. The 16-MHz and 20-MHz 486SXs will sell for $99 in lots of 1,000.

Paul S. Otellini, vice president and general manager of the microprocessor group, attributed the price cuts to less expensive, packaging and increased volume. AMD downplayed the price cuts, saying it expects the 386 to be the dominant desktop chip through 1993.

Bell Atlantic revamping infrastructure

Software upgrade, $2 billion net will be used to combat rivalry from alternative carriers

BY JOANIE M. WEXLER
CW STAFF

PHILADELPHIA — Bell Atlantic Co. plans to invest $2.1 billion over the next seven to eight years in infrastructure revamps to fend off looming competition from alternative carriers, according to Joseph T. Ambrozy, vice president of information systems and chief information officer.

Ambrozy outlined his company's strategy to attendees of the Unix Systems Information Networking Group's (USING) annual conference here last week. USING is a consortium of regional Bell operating companies (RBOC) and their business partners working to implement open systems in the telecommunications industry.

Ambrozy pegged the $28 billion RBOC's return on investment at $5.7 billion in increased revenue and reduced costs — including a significantly slimmer work force, thanks to automation.

One analyst cited Ameritech, BellSouth and Pacific Bell as other RBOCs with similar-size re-engineering programs under way. Such moves indicate that the RBOCs — long criticized for their sluggishness — have accepted that they must become more nimble to survive in the competitive network services market. This epiphany could result in speedier deployment of services in tune with the telecommunications needs of corporate customers, analysts said.

New kids on the block

Ambrozy pointed to the infiltration of alternative carriers as "a powerful incentive" for the software and network infrastructure overhauls. These relatively young carriers, he acknowledged, sport all-fiber networks and do not lug any infrastructure baggage, allowing them to react quickly and "provide good service and pricing."

He estimated that the fiber bypass market for competitors is "about a $100 billion opportunity for them nationally. And Bell Atlantic, as the network of choice, is in danger today because of its [technical] infrastructure."

Only about 5% of RBOC networks are fiber today, estimated Gerald Aneskewich, a senior consultant at RP Teletrends, a Raleigh, N.C., firm focusing on consulting work with carriers. He added that state public utility commissions recently began allowing the interexchange carriers to compete locally, so a large RBOC challenge is "not to lose the domain of local transport."

To that end, Ambrozy said he sees the RBOCs assuming the role of gateway "between users and a host of information services," including on-demand video services. He said RBOCs' success "will be reasonably closely tied" to breaking down regulatory barriers to RBOC participation in the cable TV business.

Another obstacle is the firm's software infrastructure. Ambrozy estimated that half of every dollar Bell Atlantic spends today is to maintain the company's current software, which, like that of other RBOCs, is a hodgepodge of systems separately designed for specific tasks.

The company intends to go live with a $175 million software system — dubbed SaleService Negotiation System — next month to integrate the systems with a common interface. The goal is for the company to spend less time taking orders and more time marketing new services, said Jeff Dowds, Bell Atlantic's director of information services planning.

Dowds said that currently, for example, a service order could pass through 30 to 50 systems before a service is provisioned, with potential for error and delay at every handoff point.

The new system "was sold on its ability to increase revenues," Dowds said. This was a corporate shift because "90% of the systems in the past were approved to automate labor out of the business and reduce expenses."

Strategic outline

Ambrozy said Bell Atlantic's overall software strategy has three components:

- To separate service logic software from call processing. Currently, he explained, the RBOCs are at the mercy of the switch vendors for implementing new services.
- To use the same software on all classes of computer to reduce data and functional redundancy.
- To initiate a new open systems infrastructure based largely on Unix.

In addition, the company now has an aggressive network re-engineering plan — dubbed the Advanced Intelligent Network (AIN) — under way. The AIN is a computer-based services platform that allows customers access into the network to create their own customized services.

In addition, Ambrozy said, the firm aims for 65% of its network to be digital and 96% of the network to be equipped with Signaling System 7 — intelligent software allowing a slew of services based on a calling party's number — by year's end.

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NEWS SHORTS

Alpha upgrade prices detailed

Users seeking to upgrade to Digital Equipment Corp.'s Alpha systems can now peruse an extensive list of upgrade prices for their VAX/VMS or DECstation/DECsystem machines. Available through DEC's sales force, the price list also includes "daughter card" upgrades to the next generation of DECstation/DECsystems. Customers ordering Alpha upgrades now will be guaranteed that price, which includes trade-in values, installation and a one-year warranty.

EDS to lose outsourcing pact

After a four-year outsourcing relationship, Electronic Data Systems Corp. and Freeport McMoRan, Inc. are parting ways. EDS said Freeport, which has shrunk and shifted its business since the contract began, wanted too many concessions to help it through troubled times. Published reports said Freeport gave EDS the boot. EDS will be replaced within the year by IBM's Integrated Systems Solutions Corp. subsidiary, along with Andersen Consulting and ComputerLand Corp.

BellSouth talks SMDS, frame relay

BellSouth last week disclosed deployment plans for two kinds of packet-switched data networks. It will begin offering both Switched Multimegabit Data Service (SMDS) and public frame relay, supported by AT&T's BNS 2000 digital-switching platform, to customers in selected cities this year. A new data services organization, dubbed Data Bubble, will have end-to-end responsibility for the company's various network services. The SMDS service will offer 1.1M bit/sec. to 34M bit/sec. access speeds; the frame-relay service will offer the 1.544M bit/sec. rate. Pricing will be available this summer.

Cabled, wireless LANs unite

Two large smart-wiring hub vendors say they will private-label wireless local-area networks from other companies and integrate those LANs into their Simple Network Management Protocol-based network management schemes. Ungermann-Bass, Inc. is offering Motorola Wireless Enterprise Systems' Altair Plus wireless Ethernet LAN modules for its UB Access/One wiring hub for $3,995. Cabletron Systems, Inc. said it is marketing Windata, Inc.'s $5,200-and-up FreePort wireless Ethernet, unveiled last week (see story page 80).

Pa. senate reconsiders tax

Pennsylvania state Sen. Melissa A. Hart (R-Allegheny) will introduce legislation in the state Senate tomorrow that would repeal the state's sales tax on computer programming, data processing, systems integration and other computer services. She noted that Pennsylvania is the only state to have such a tax, adding that "its continuation will clearly impair our competitive position."

Short takes

The Software Publisher's Association has released the *SPA Software Management Guide*, which offers assistance in establishing policies and procedures for the purchase, registration and use of software. The $80 kit includes the SPAudit auditing package, an informational video and education brochures. . . . In the third quarter, Hewlett-Packard Co. will resell Storage Technology Corp.'s 4220 cartridge tape drives for use with HP 3000 and 9000 systems. . . . Lotus Development Corp.'s 1-2-3 for DOS Release 2.4, which costs $495 and includes some graphical features and performance boosts, shipped last week. Lotus will ship 1-2-3 for DOS Release 3.4 in the fall. . . . Cyrix Corp. has gained two customers — Wyse Technology, Inc. and Austin Computer Systems — for its CX486SLC microprocessor. . . . Wang Laboratories, Inc. confirmed reports that Wal-Mart Stores, Inc. will resell the Alliance Series line of personal computers. . . . Pyramid Development Corp. is shipping PC/DACS, a $249 security package for IBM's OS/2 2.0 that provides user identification and authentication, session time out, encryption and boot protection.

Positioning for tape turf

Beating IBM to the punch, Storage Tek extends line of tape libraries

BY JEAN S. BOZMAN
CW STAFF

LOUISVILLE, Colo. — Storage Technology Corp. launched a preemptive strike at IBM last week, unveiling a souped-up model of its 4-year-old automated tape library just days before IBM's planned entry into the market.

At the same time, Storage Tek introduced two downsized tape libraries and a driveless library.

"This announcement is part of our normal process," said Ron Korngiebel, manager of planning for Storage Tek's marketing division.

The IBM threat

But some industry analysts said they believe that Storage Tek, which is estimated to have at least 80% of the worldwide tape library market, fears encroachment by IBM. Freeman Associates, Inc., a Santa Barbara, Calif.-based market research firm, said worldwide revenues for all tape library companies came to $646 million in 1990, jumping to $843 million in 1991.

"The concern is that they've done a very good job of saturating their market at the high end," said Robert Callery, an analyst at Technology Investment Strategies Corp. in Framingham, Mass. "But IBM's going to give Storage Tek a run for its money in [the few] large accounts that haven't yet committed to a library."

"This announcement puts IBM on the defensive because all of Storage Tek's specs are better," said Nick Allen, an analyst at Gartner Group, Inc. in Stamford, Conn.

One plus for IBM, Callery said, is 36-track recording technology — something Storage Tek will not deliver until next year. Meanwhile, Storage Tek's new tape libraries will include the following:

- PowderHorn 9310 ACS, a 6,000-cartridge library with robotics that performs twice as fast as the original 4400. It can handle 350 cartridge exchanges per hour.

Current 4400 units can be field-upgraded to PowderHorn for $150,000, starting in the first quarter of 1993. The price for a new unit is $305,000, not including the tape drives, which cost $20,000 each.

- TimberWolf 9350 ACS, a 500-cartridge library that handles 350 exchanges per hour. The $95,000 unit will ship in the fourth quarter.
- WolfCreek 9360 ACS, a 1,000-cartridge library that is twice as large as TimberWolf. The $125,000 unit will ship in the third quarter.
- ExtendedStore Library, an addition to the original 4400 tape library that can store up to 6,000 archived tapes. This unit has no tape drives, but cartridges can be "passed through" to library units that have robotics. It is now available at a price of $130,000.

Users said the new Storage Tek tape libraries will be useful, but some said tight information systems budgets will delay near-term purchases.

"We're always moving cartridges in and out of the silos," said Greg LaRue, who manages hardware and configuration services at BankAmerica Corp.'s Concord, Calif.-based data center. "It would be more convenient to leave the cartridges in a library for easy access."

The bank's three data centers have 15 Storage Tek libraries.

IBM tape library off on wrong track

CONTINUED FROM PAGE 1

correct tape drive.

In comparison, the Storage Tek 4400 Automated Cartridge System is tall and round.

Storage Tek, first on the automated tape library scene with its silo introduced in January 1987, brought out new members of the family last week in anticipation of the IBM announcement (see story above). Memorex Telex Corp. also recently enhanced its automated tape library [CW, May 11]. At least one analyst said be expects Hitachi Data Systems Corp. to enter the fray also.

IBM spokesmen would not comment on the upcoming announcement, but analysts said the 3495's greatest strength will be software that allows customers to manage tape, disk and optical media under the purview of its Systems Managed Storage umbrella.

"That's what will help sell this," said Robert Callery, an analyst at Technology Investment Strategies Corp. "Anything that can help customers manage where to store data based on how often they use it [will be a selling point]. It doesn't really matter if it's tall and pretty or long, flat and ugly. The issue is, does it help do the job better?"

Other advantages include support for both 18- and 36-track tapes, according to Nick Allen, an analyst at Gartner Group, Inc. in Stamford, Conn. In comparison, Storage Tek only supports 18-track tapes. However, Allen said, the 3495 will be "the slowest on the street" in terms of performance, although be did not have specifics.

Playing catch-up

Allen said IBM, although late, had to introduce the 3495. "It's a manhood issue. You can't be in this market without a tape library because you can't sell tape drives without one."

IBM, in fact, had earlier versions of the 3495 that it opted not to introduce. "When they finally made the decision not to enter the market [about 1986], they told me they did not feel there was a significant market," Nynex's Shaffer said. "Obviously, they were wrong."

At best, IBM could make a longer term dent in the market. Robert Abraham, vice president at Freeman Associates, Inc., a market research firm in Santa Barbara, Calif., said, "Some true Blue shops have been waiting to see what IBM has. In the long term, IBM is a strong player, no matter what the library looks like." Storage Tek, with some 3,900 systems installed, has more than 90% of the market.

At worst, the 3495 will be "too little, too late," said William Dean, director of technology management services at Pepsico, Inc. in Purchase, N.Y., and a Storage Tek customer. "They'll sell a bunch because it has the IBM logo," he said, "but Storage Tek has done extremely well with a good product, priced competitively."

CORRECTIONS

A new product announcement in Enterprise Networking on May 11 incorrectly referred to the Lace L00-59 laser transmission device as the L00-50. The Lace L00-59 is produced by Laser Communications, Inc. in Lancaster, Pa.

In a networking story on frame relay in the April 6 issue, Chris Heckart of WilTel is quoted as saying that today's public frame-relay networks "can't prevent one user's network abuse from affecting another user's performance." Heckart said she intended the comment to apply to services not based on the StrataCom, Inc. IPX switch.

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Seeking to unravel snarled projects

CONTINUED FROM PAGE 1

evidence that they are getting any better at solving them," said Jack L. Brock Jr., the GAO's director of government information and financial management issues.

The U.S. Department of Commerce, which has received stinging criticism for its system snafus, has moved to solve its internal management problems. "In the past six years, we've relieved seven project managers," said Reed Phillips Jr., director of information resources management. "We've found that most of them were ill-equipped to take on large projects."

The Commerce Department's National Weather Service has seen most of the problems that plague large government IS efforts. Four key systems to improve the nation's weather forecasting were originally budgeted at $1.4 billion but now carry a $4.2 billion price tag. The Weather Service admits poor management but attributes much of the cost overrun to expanded requirements.

Thomas. Giammo, assistant commissioner for IS at the U.S. Patent and Trademark Office, was brought in temporarily in 1990 to turn around the most troubled of the weather system projects. Giammo blamed both the government and the prime contractor.

Stormy weather

Faced with initial schedule slips, Weather Service managers began cutting corners in systems designs, declaring them finished prematurely. Giammo claimed that Unisys Corp., the prime contractor, then bid low on incomplete design specifications and sent the government huge bills for "out-of-scope" work.

The Weather Service and Unisys eventually reached a compromise, but the system will be seven years late and 335% over budget, according to the GAO.

Phillips said the Department of Commerce has gotten good results recently under the new "Trail Boss" program, sponsored by the U.S. General Services Administration (GSA), which oversees the government's IS procurements. The idea is to have a single senior program manager who possesses strong technical and administrative skills ride herd over projects from concept through contracting and implementation.

According to Fred Sims, the GSA's deputy assistant commissioner for information resources management, 350 trail bosses have been trained.

Despite the improvements, the government must still rely on contractors for management and technical skills, said Joseph J. Leo, deputy administrator for management at the Food and Nutrition Service. "I have people I'll put up against any in the country, but I can't attract enough of them nor do I have the resources. We have to [partner] with [service companies] to make up the difference."

A few agencies have created senior chief information officer positions, but some of the enthusiasm for that idea — as in the commercial sector — seems to have waned. The U.S. Department of Veterans Affairs named an IS czar in 1989, but it abolished the post a year ago as part of a move to decentralize.

The CIO concept may have suffered from the reluctance of IS managers in autonomous units to cede power to a central figure. "CIOs were sometimes isolated from programs," Brock said. "A CIO recently told me, 'I'm not the chief of anything.' "

To many, including former GSA procurement analyst Terry Miller, the problems all boil down to lack of expertise by those who buy and install information systems. "The problem most agencies and many vendors have is they send amateurs to do the job," said Miller, now president of Government Sales Consultants, Inc. in Great Falls, Va.

Miller criticized the lack of training for procurement officials: "[Even] if you have an IQ of 160, you can't learn this business in two years on your own." The GSA needs a rigorous system for certifying procurement specialists and a 5- to 10-person hot line to support agency purchases, he said, adding, "It would be worth millions."

High expectations

Paul Oliver, a vice president at the Bethesda, Md., office of Booz Allen & Hamilton, Inc., said that even the best of government program managers are often doomed from the start by the overly ambitious and naive requirements laid on them. He said $300 million programs — let alone $1 billion jobs — are just not manageable, at least by traditional means.

There is evidence, however, that some agencies are learning how to get the most out of large-scale projects. Last September, the GSA published a report outlining four alternatives to the "grand design" approach to systems development — all variations on the downsizing theme [CW, Sept. 2]. A number of large agencies, including the Internal Revenue Service and the U.S. Department of Defense, are now attempting to break big efforts into smaller, less risky chunks.

"We are overhauling our life cycle management policy," said Paul Strassman, the Pentagon's director of defense information. "It is now being revised, gutted and redone," he added, noting that a new policy allows and encourages the use of four optional "evolutionary and incremental" approaches to systems development.

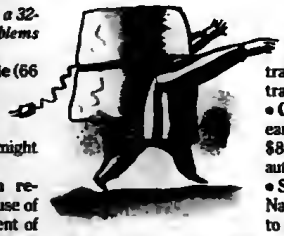
Some agencies are using a new methodology, called the "spiral" methodology, that does not require all uncertainties to be resolved at the beginning of a project, as is often the case in traditional approaches.

Rona Stillman, chief scientist at the GAO's Information Management and Technology Division, said the jury is still out on the new approaches to developing large systems.

"Philosophically, they make a lot of sense, but there's not a whole lot of evidence yet that they will succeed," she said.

Federal IS projects plagued with problems

In a recent summary of its findings during a 32-month period, the GAO said federal IS problems stem from the following 10 problem areas:



- **Inadequate management of IS life cycle** (66 citations). In 1990, the GAO cited poor capacity planning as the reason it believed the Federal Aviation Administration's new computers planned for the Los Angeles area might not be able to handle the work load there.
- **Ineffective oversight of information resources management** (29 citations). Because of poor system procedures, the U.S. Department of Education gave $109 million in new student loans to students who had defaulted on earlier loans.
- **Security, integrity and reliability flaws** (16 citations). Because access control at a sensitive data center was inadequate, and software that could bypass security safeguards was easily available, the U.S. Department of Justice could not ensure the security of highly classified information, such as names of informants and undercover agents.
- **Inability of systems to work together** (14 citations). Because key systems at the VA could not exchange data, clients faced lengthy delays having claims processed.
- **Inadequate resources to accomplish goals** (9 citations). The U.S. Navy put together an ambitious schedule for developing software for a submarine target detection system. The schedule assumed the use of experienced Ada programmers, but the contractor doing the work had an inadequate Ada training program.
- **Cost overruns** (22 citations). The GAO unearthed $7 billion in cost overruns, including an $800 million increase in the IRS' estimated cost to automate the examination of tax returns.
- **Schedule delays** (20 citations). By 1994, the Navy will have spent 17 years developing a system to automate the preparation and editing of payroll and personnel documents. The system was originally due for completion in 1982.
- **Systems not performing as intended** (7 citations). Problems in the 1988 tax filing season stemmed from an imaging subsystem that did not work, forcing IRS workers to use stopgap measures with paper copies of returns.
- **Inaccurate or incomplete data** (18 citations). NASA had incomplete or missing data from many important space missions. No data from one Apollo mission could be found.
- **Difficult access to data** (8 citations). The U.S. Coast Guard's major law enforcement system was so difficult to use that it was essentially ignored.

Source: GAO

The push is on

BY SHERYL KAY
SPECIAL TO CW

Try as it might, the federal government is still wrestling with ways to overhaul how it procures information technology. The U.S. Air Force, for example, last year failed in its attempt to accelerate the process when it sent out a request for proposals for a large number of personal computers under its $1 billion Desktop IV procurement.

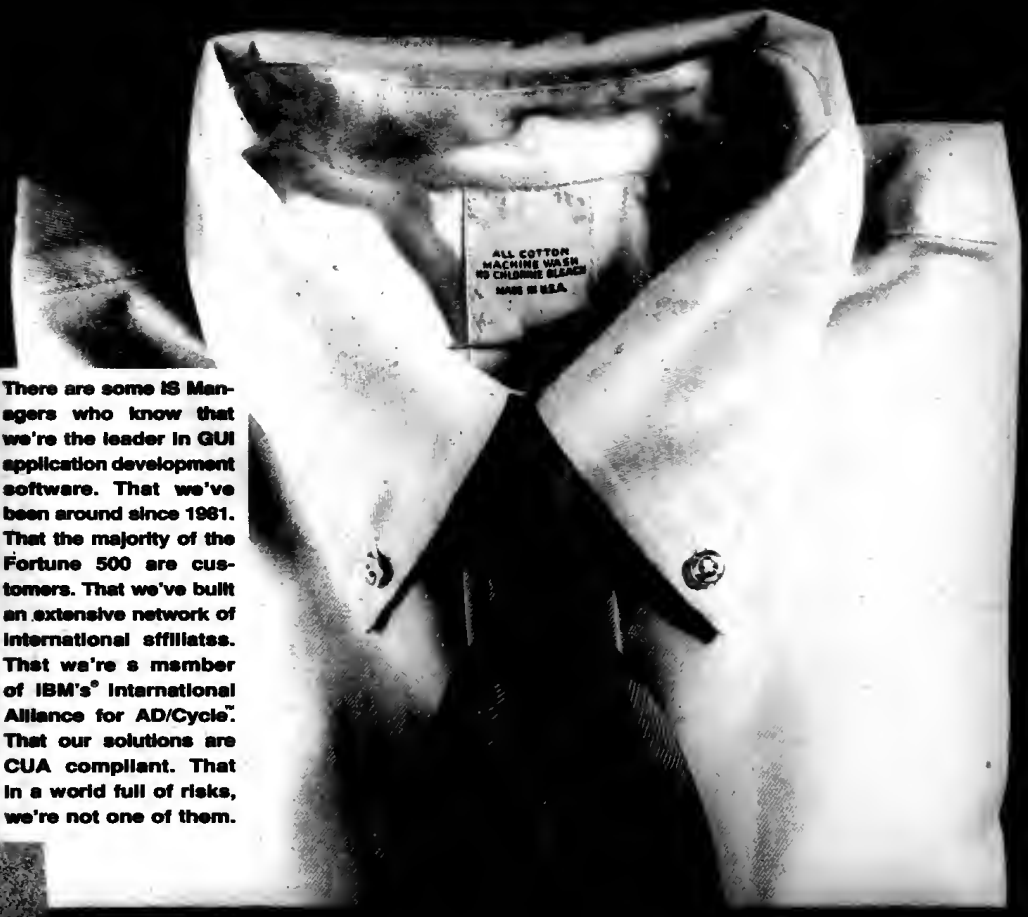
Using a method called Fast Track, the Air Force's bid solicitation was written with highly streamlined and functional specifications.

In November, the Air Force selected CompuAdd Computer Corp. and Sysorex Information Systems, Inc. for Desktop IV. Eight bidders — led by Apple Computer, Inc. — immediately protested. In January, the Air Force terminated the contracts.

Some industry observers postulated that the Air Force was pressured into rescinding Desktop IV because those that protested were larger government contractors.

"We [canceled the awards] because it was right. Nobody bullies the Air Force," said Carl Peckinpaugh, Air Force procurement attorney.

Kay is a Tampa, Fla.-based free-lance writer.



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Judge to rethink Apple case in copyright battle

BY JAMES DALY
CW STAFF

SAN FRANCISCO — Apple Computer, Inc.'s copyright infringement suit against Microsoft Corp. and Hewlett-Packard Co. got a temporary reprieve last week after a federal judge agreed to reconsider a decision he issued last month that seemingly crippled the lengthy legal action.

U.S. District Judge Vaughn Walker surprised many observers last month by declaring that many of the Macintosh screen graphics that Apple claims Microsoft and HP violated were either not protected by copyright law or fell under a 1985 technology licensing pact [CW, April 20].

Although Walker granted Apple's request to review last month's decision, he did so reluctantly and chided Apple's lawyers for taking so long to file the necessary reconsideration papers. "The court is sorely tempted to reject Apple's motion out of hand, and I feel I would be on firm legal ground in doing it," he said.

Observers said Walker granted the motion in part because of the importance of the case and to take the steam out of an expected appeal from Apple. "[Walker] is just going through the motions at this point," said G. Gervaise Davis III, a lawyer specializing in intellectual property law at Davis and Schroeder P.C. in Monterey, Calif. "He's protecting himself. If he denies the motion to reconsider, [it] may appear that he acted capriciously."

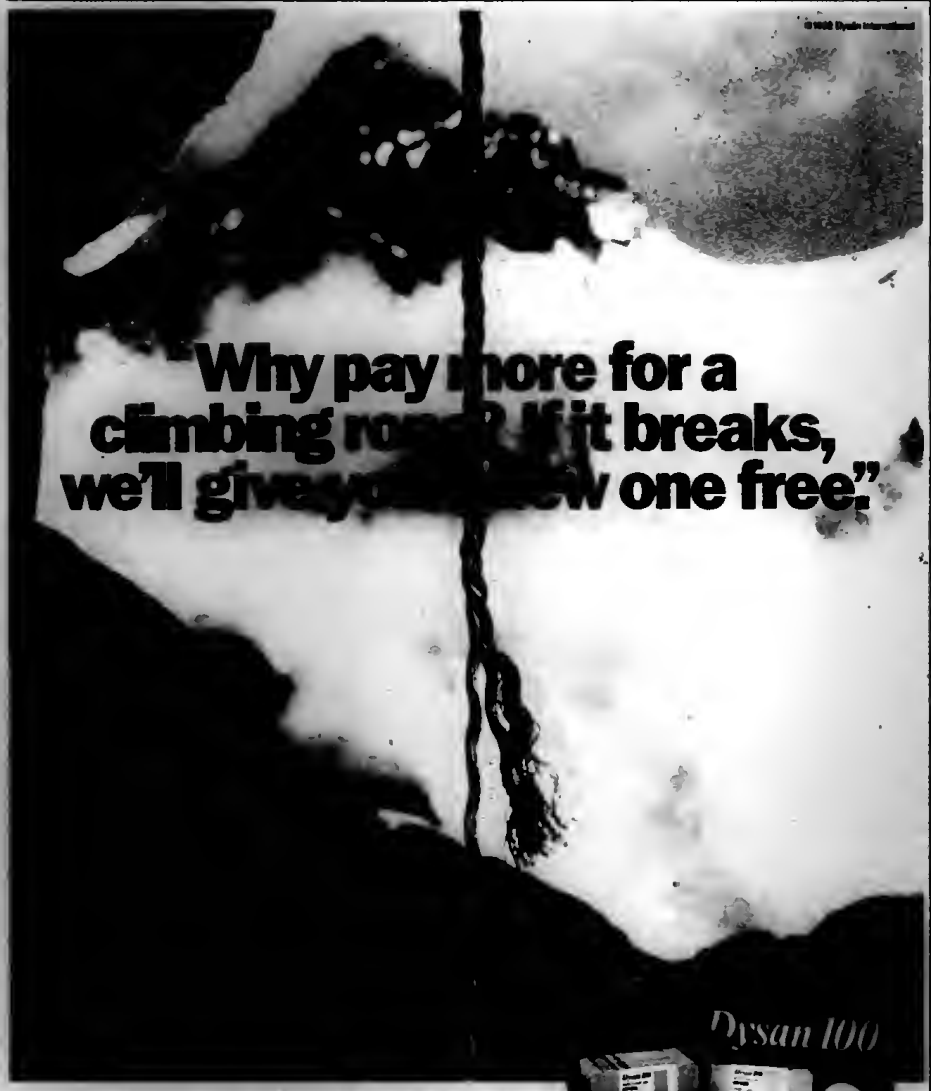
Legal precedent

Such a reconsideration, however, would not be without precedent. In April 1991, U.S. District Court Judge Terrence Hatter Jr. reversed a potentially devastating ruling in which he stripped Ashton-Tate Corp. of the copyright to its flagship dBase product line [CW, April 29, 1991].

Walker's decision to reconsider means that Apple's suit will continue at least until early June, when the judge plans to hear more arguments regarding Apple's request for reconsideration. Microsoft has already filed a response, but HP was given 20 days to file additional documents.

The ruling last month was typical of the lengthy seesaw courtroom battle. Last year, for instance, Walker upheld Apple's contention that the visual elements of the Macintosh screen display are original and were not part of the technology licensing agreement Apple inked with Microsoft in 1985.

Apple officials have said the runaway success of Microsoft's Windows environment has come at the expense of the Macintosh. Last month, Apple estimated that the alleged infringement amounted to $5.55 billion in lost revenue.



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Firms complicate wiring standards

BY JOANIE M. WEXLER
CW STAFF

Potentially muddying the standards process for putting the high network speeds of Fiber Distributed Data Interface (FDDI) on copper cabling, 11 companies, including IBM, announced plans last week to adhere to a common specification for supporting 100M bit/sec. speeds on shielded twisted-pair wiring.

The allegiance means that many shielded twisted-pair products — which have been anemically received for the past year — will interoperate.

The alliance of local-area network and chip vendors moves the industry a small step toward 100M bit/sec. copper networking by providing a degree of interoperability ahead of a formal standard. But some analysts worry that the move will derail formal standards work because the standards committee has already rejected the technology blessed by the alliance.

The standards committee decided earlier this year to pursue one standard for both shielded twisted-pair and data-grade, unshielded twisted-pair wiring. The latter is being deployed "at an unprecedented rate, largely so users can do FDDI over it at some point," said Paul Callahan, a senior analyst of network strategies at Forrester Research, Inc. in Cambridge, Mass.

However, rather than rallying around one of the combined support proposals now being considered by the standards committee, the allied vendors opted to back technology the committee has already decided against. The 11-vendor muscle could persuade the committee to reconsider a shielded-only standard, analysts said.

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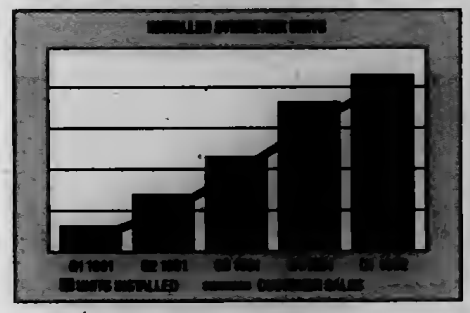

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S E R I E S

ADVANCED TECHNOLOGY

Movie technology puts an end to bad endings

Video browser may let viewer choose own levels of happy or sad, sexy or not, when tuning into future flicks

BY CAROL HILDEBRAND
CW STAFF

How many times have you itched to change the ending of a movie? Or delete out, say, Leslie Howard's Milquetoast characterization of Ashley Wilkes in *Gone With the Wind* in favor of someone with a little more backbone?

Judging from what's percolating at MIT's Media Laboratory, it looks like people will someday be able to mix movies to match their preferences.

The lab's Interactive Cinema Group is working on producing the first entirely digital movie, a process that is long overdue, according to research assistant Stephen Fitch.

"The movie industry is probably one of the last frontiers of really analog systems," Fitch said. He pictures a scenario in which video stores have gone on-line. Instead of the cumbersome rent-and-return trips to the video store, prospective renters will log onto a video file server and electronically browse around until they select a movie, which can then be downloaded for home viewing.

But that's just the starting block. Fitch is now working on a prototype of an interface that an on-line movie renter might use.

The interface is a three-dimensional virtual environment from which a viewer can perform a search of movies and then choose a particular digital title. Once the movie is chosen from the array of electronic video boxes, the box unfolds into the interface of the digital movie browser. Fitch said he designed the browser to look like the video rental box because he realized that that was almost the only physical representation of film that mass audiences have access to.

Digital dynamics

The video browser offers all the information from a regular box, but on an interactive basis. Newspaper and television reviews, movie previews and interviews with the filmmakers would all play via digital video.

The last twist of the browser is the fact that it will offer the viewer a chance to customize the movie. Fitch says the interface he is working on will offer three sliding knobs for starters, which work similarly to a volume control. One controls the rating of a movie; that is, a viewer can choose whether he wants the film to play to a PG audience or an X-rated one. The other two allow a viewer to set parameters on how much sex and violence they want in their movie.

Once the digital movie process becomes widespread, "A menu could drop down, and you might be able to choose from a comedy Woody Allen style, or a thriller Scorsese style," Fitch said. The sliding parameter knobs would choose how much of each style would be needed, and the database would then access the footage and put together a film.

Digital technology *is entering the movie industry with promise of benefits to filmmakers and viewers*

Such a scenario obviously demands changes in the creative process. Rather than a linear plot line, the movie would have to be made using what Fitch refers to as multithreaded narrative. Essentially, the same scenes would be written several different ways and perhaps to suit the styles of specific actors or directors. Several different writers, each skilled in a different genre, might write different versions of a film.

With the Media Lab's first digital effort tentatively scheduled to start shooting around November, Fitch is also working on previsualization tools that he says are vital to juggling such a project. When shooting what are several different movies that must seamlessly fold in and out of each other, processes such as dissolves and transition effects become difficult.

For example, Fitch is using applications such as Autodesk, Inc.'s 3D Studio to animate scenes before they are shot, or HumanCad's Mannequin, which puts human models into drawings. Fitch uses it to create an interactive storyboard.

The Media Lab will be wired for fiber optics, and a theater that can show digital film is being built.

Sign of the times

Fitch acknowledges that a generation brought up on linear films may not take to this wholeheartedly. But, he points out, Charlie Chaplin hated the idea of sound in film, and the cinematic experience evolved in spite of him. His cinema will meet different needs. "What we're talking about here is the Nintendo generation," he said.

Fitch's scenario is not as far-fetched as it might sound on first run-through. With the announcement of Pacific Bell's Advanced Broadcast Video Service (see story at left), the stage is being set for big-screen features flickering over cross-country fiber-optic lines in less time than it takes the credits to roll.

The day can't be far away when we will at last get to see what *Casablanca* would have been like with the original choice for Rick in the role: Move over Bogey, here comes Ronald Reagan.

Quiet on the set! Lights, camera, digitize

BY JAMES DALY
CW STAFF

Pacific Bell is raising the curtain on a new digital broadcast service that may become the celluloid of the future for the movie industry.

The San Francisco-based telecommunications carrier this month demonstrated a computerized movie distribution system that transfers the hairiest car chase or steamiest love scene into electronic code and then sends it to theaters through fiber-optic phone lines.

Pacific Bell's Advanced Broadcast Video Service (ABVS) would eliminate the need for filmmakers to print and distribute hundreds of copies of first-run films in giant metal canisters — copies that ultimately scratch, snap and degrade.

"After only a few showings, films may have acquired noticeable scrapes, breaks, butter-flavored fingerprints and occasional splashes of cola," said Rich Mizer, project manager for ABVS. "In the future, movies will arrive at theaters as computerized data streams — flawless electronic celluloid that dazzle in comparison with traditional film."

Digital transmission over fiber optics ensures that the signal received exactly replicates the signal sent, virtually eliminating atmospheric, electric or environmental interference, Mizer added.

Because the electronic information is so tightly compressed, it takes only about three minutes to transmit a two-hour movie virtually any distance.

Theaters could also speed film turnaround. Flops could be yanked instantly, hits ordered and repertory theaters — which may show a movie only a day or two before moving on to the next one — could enjoy a resurgence.

There is one stumbling block. While getting the movies to the theaters may not prove difficult, projecting a film-quality video image from the back of the theater onto the silver screen may be tricky. Video images often tend to have a certain inherent flatness and are simply not able to match the sharpness and brilliance of film.

One solution may be high-definition television (HDTV), an emerging video technique that achieves high resolution by scanning the screens of special televisions with 1,125 horizontal lines of information compared with 525 lines in conventional televisions. But that still may not be enough: The standard 35mm film offers the equivalent of 2,000 lines of information.

Meanwhile, such companies as General Electric Co. are working on high-powered video projectors that can splash images onto a giant screen. They offer crisp, bright pictures up to 30-feet wide, but they are costly at about $250,000 each.

If ABVS is a hit, the service could potentially replace current analog telecommunications technology for all grades of video, from HDTV to high-quality videoconferencing.

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EDITORIAL

'Our Gang' comedy

What's happened to this old gang of ours?

You can bet there's at least two groups asking themselves exactly that — the Advanced Computing Environment, known as the ACE consortium, and the Open Software Foundation, better known as OSF.

Led by Microsoft, Compaq and DEC, ACE promised "to develop dual standards for PCs and RISC systems." That's what ACE founders said.

OSF, led by just about everyone, was going to "create an open systems environment based on industry standards as well as emerging standards." That's what OSF founders said.

Last month ACE lost Compaq, which was supposed to produce the most ACE-compliant systems. It seems some ACE members have found their individual goals conflict with those of the group (surprise, surprise).

And last week, we revealed that DEC had restarted development work on its own Unix operating system, Ultrix. DEC insists it will make OSF/1 its "Unix for the '90s," yet there are no plans now to put OSF/1 on future versions of DEC's current DECstation line of Unix boxes. We also revealed that OSF might be backing away from its primary goal — developing an alternative to AT&T's System V Unix operating system.

Rather than provide any pithy insight into these events, I'd rather look back at what was said when ACE and OSF were born.

On ACE: "This will be the predominant system for advanced computing within this decade." — *Rod Canion, former Compaq chairman.* "I don't think Compaq has ever worked with anyone before, have they?" — *Ken Olsen, DEC president.* "I'm not saying IBM will like what we're doing here. But this should give a boost to OS/2." — *Bill Gates, Microsoft chairman and CEO.* "If they can pull it off, fine. But I have seen how long it takes for a group like this to agree on a common set of criteria. Just look at OSF." — *Franz Nawratil, Hewlett-Packard.*

Good idea; let's look at OSF: "Open systems are part of the public trust." — *Ken Olsen.* "We've made a significant investment in Unix and are totally committed." — *John Akers, IBM chairman.* "Customer demands have been put ahead of our proprietary interests." — *HP Chairman John Young.* "Democracy is for electing presidents, not building products." — *Industry pundit Esther Dyson.*

You get the idea. Promises, promises. We're all going to get along just fine. We'll respect one another in the morning, too. We the vendors will deliver industry standards.

Best case, such consortia creak under the force of their own weight and vastly underperform with respect to the expectations they themselves raise. Worst case, they fly in the face of a user-driven marketplace where it is the customers, not the vendors, who set the standards.

Bill Laberis

Bill Laberis, *Editor in chief*

LETTERS TO THE EDITOR

Not just support

Regarding "Network managers criticize Banyan's support" [CW, April 20], you make it appear that support was the only issue discussed at the Banyan users' meeting.

The user group had much more to say to Banyan — and Banyan had much more to say to us — than just that the company needs to find a way to provide more direct support to its users.

Our message to Banyan is the following: "Support is key to our organizations' success. We need it to be accurate. We need it to be timely. How you deliver it is incidental."

Despite your assertion that Banyan has only "recently begun" to listen to its users, the fact is that Banyan has always listened. We may not always like the responses we get, but we can't really accuse Banyan of not listening.

The Association of Banyan Users International and its affiliated groups provide s forum for our members to gain the knowledge they need to manage their networks. The information exchange that goes on is much more than criticizing Banyan for a perceived failure to provide the proper level of support.

Byron Comp
President
Association of Banyan Users International
Sudbury, Mass.

IBM's OS/2 2.0 not a last-ditch effort

I find myself very disappointed with a portion of "Inside Lines" in your April 20 issue.

Above the item that relates IBM Vice President Jim Cannavino's offer to give free copies of OS/2 2.0 to the sttendees of Borland's Developer's Conference appears the headline, "Are they desperate or what!"

A line like that smacks of the cheap-shot, "bugs-in-Boca?" attitude that Bill Gates and Microsoft have purveyed in the marketing war between Windows 3.1 and OS/2 2.0.

The implication is that OS/2 2.0 is a last-ditch effort thrown together by a company going down for the third time.

Quite to the contrary, it is obvious that IBM is putting "walk to its talk" by giving away its product to the group of people who will be the most instrumental in the life or death of OS/2 2.0. This is not s sign of desperation but a sign of confidence in the technological superiority of the product.

OS/2 2.0 was done right. Confident of that fact, IBM obviously cannot wait to get it into the hands of those who will prove it.

Brendt W. Waters
Integrated Systems Solutions Corp.
Marietta, Ga.

There's no excuse for virus illiteracy

Every article I have read about computer viruses discusses them as if they are in the same category as the flu or measles — something over which we have no control. They are not.

Viruses are deliberately developed and spread by people who have sbsolute control over whether they are spread or not.

By now, appropriate antivirus security policies, procedures and controls should be in place at any company that uses computers. Even people who have purchased computers for home use should be computer-literate enough in this day and age to implement some basic security controls. It's really not that difficult.

I find it amazing that viruses have been found "shrink-wrapped" with legitimate software. How did they get there? When these incidents occur, do the vendors investigate to find out who was responsible? If the infection was accidental, appropriate security procedures should be implemented immediately to prevent recurrences. If it was deliberate, the perpertrator should be sought out and vigorously prosecuted.

It's fine to have "antidote" software, but I think it is time for another approach — holding people accountable for the spread of computer viruses.

Lynda King
Computer operations & technical support
Consolidated Group, Inc.
Framingham, Mass.

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Don't be too quick to bash

CHARLES P. LECHT

Recently, I received a fax from a young Japanese friend, Tomoko, saying that she was moving to America to work on a computer project and that she hoped she wouldn't be bashed too much.

Given the stuff that has been served up lately by both Japanese and American politicians, this doesn't strike me as an unrealistic concern. But, recalling the polite reception I received seven years ago when I came to Japan to work in the computer industry, I am sad to think she might have reason to worry.

Unlike other places I've been, where foreigners are subjected to harassment, in Japan the converse is true. Being a "gaijin" isn't always easy: There are many adjustments that must be made — including the realization that you may never really understand the motivations of the people around you. Still, in my experience, the Japanese are unfailingly patient and polite in their treatement of strangers living and working among them.

Some of my compatriots don't think this is enough. "Yeah, I know," one friend said when I shared this impression with him, "but it's insincere politeness." Frankly, I don't care as much about motivation as much as outcome. As I told my friend, "I never question the sincerity of those who treat me well."

M. E. Cohen

In fact, however, the kind of response I received wasn't just surface politeness, but a sincere willingness to provide practical help.

American folklore would tell you that starting a software company in Japan is something that's close to impossible for a U.S. citizen, but that's just what I did. No insurmountable obstacles were placed in my path. Instead, cooperation and assistance were forthcoming from everyone from immigration to banks and real estate agencies, just as long as I made my plans clear.

It took me some time to appreciate and adjust to some types of Japanese behavior. Learning how to be silent in the face of apparent misunderstanding was a tough one. Americans are raised in a culture that suspects silence in the face of adversity as a possible admission of guilt. The Japanese, on the other hand, respect silence as a tool to employ until solutions to problems are found.

Dealing with true humility isn't easy either. Americans in general — and American computer professionals in particular — are a boastful breed. By contrast, the Japanese computer professional is a team worker like none I've ever known before. "We" instead of "I" is the norm in talking to Japanese computer people working on projects.

I don't mean to sound like I think Japanese society and the Japanese computer scene are flawless. They aren't. There have been some times when I've felt like I was not dealt with fairly, and there are some business customs here that I think are pointless or wrong — such as endless meetings, long hours and the practice, still current in many companies, of asking employees to engage in public self-criticism.

But on the whole, Japan and I have come to terms, and it has welcomed me. I just hope that despite all the recent hullabaloo and acrimonious words, my own country treats Tomoko as well.

Lecht is an IDG News Service foreign correspondent based in Tokyo.

Here's a radical research idea: How about asking a customer?

ROBERT STEARNS

Here'a a slice of truth for you: "Market research firms tend to serve the same function for the PC industry that a lamp post does for a drunk." I didn't say that; it comes from Bob Cringely's recent book, *Accidental Empires*, which is a history of the development of the PC and related industries. I wish I had said it, though, because it is right on the mark. The only thing I'd argue with is limiting the criticism to PC research.

I don't mean this to be an indictment of the market research industry — hell, they're just trying to respond to the demand for such numbers created by vendors, potential investors, security analysts and trade publications. My concern is that these firms and their clients are unwittingly (I hope) engaging in a pattern of behavior that is detrimental to both vendors and customers. It's really quite amazing how these estimates are arrived at, and how they take on the weight of fact.

Step 1: A young MBA, spreadsheet in hand, juggles various quantitative facts (earlier guesses that are now old enough to be considered bedrock truth) and arrives at a first estimate of, say, the annual growth rate for LAN-attached snuff boxes.

Step 2: He publishes a report, a summary of which is printed in one or two of the trade pubs. The report is also purchased by a handful of clients.

Step 3: A few other market research firms, not to be outdone, publish reports on the same subject, offering up pretty much the same estimates. We now have consensus: "The LAN snuff box market is growing at 73.5% per year."

Step 4: Venture capitalists and investment analysts begin wondering where to find the next great snuff box vendor.

Step 5: Marketing departments at dozens of vendors begin to churn their spreadsheets and prepare market requirement statements and overhead presentations for senior management.

Step 6: Rumors of the first annual "Snuffcom" exposition begin to circulate. The atmosphere is electric with anticipation.

Sadly, nobody along the way has thought to ask a real live customer or two if they want such a product.

The people who create and use these estimates know they are mostly junk. The only reason they are so popular is they provide a way to diffuse responsibility for making potentially expensive investment decisions.

I have a simpler and healthier solution: Throw away all estimates accurate to three significant figures. There are really only four phases of market growth, no precise numbers required. These are:

- **The Oh Wow Phase:** A growth rate so fast that it hasn't yet settled down to a rate, just pure acceleration. (What a country!)
- **The Usual Growth Phase:** The standard early to midstage market growth rate for most techno-gizmos: 50% going to 25%. Still plenty of opportunity.
- **Market Stability:** No growth here, just a commodity or replacement market. The Japanese are getting ready to enter now.
- **All over:** Market decay. On to the next gizmo.

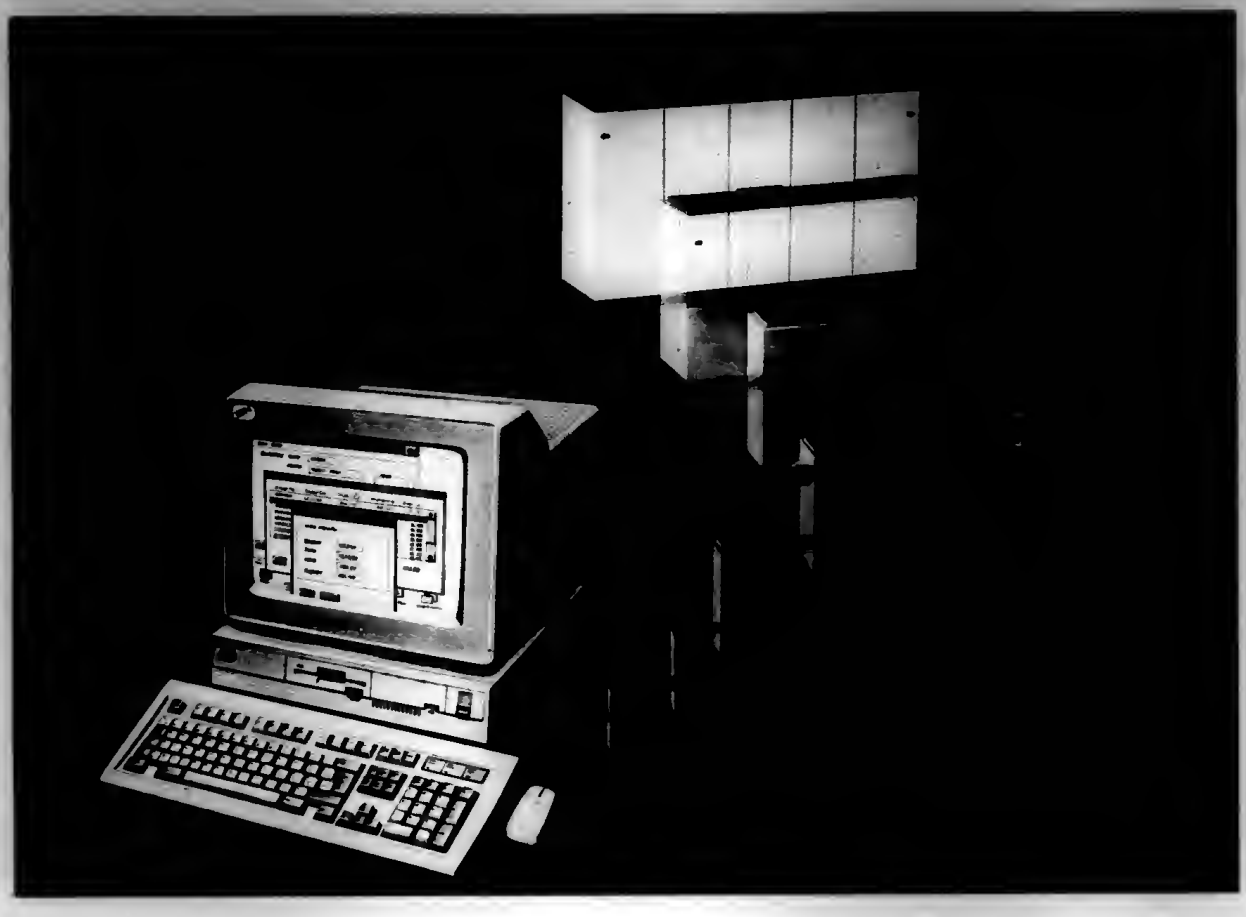
Investors and established vendors want to get into the market at the Oh Wow Phase, stay through the Usual Growth Phase, and exit, profits in hand, well before Market Stability sets in. Total elapsed time: 18 to 24 months.

This is a rather compressed time frame in which to make (or lose) money. In fact, it's so compressed that if you're waiting for a market research firm to validate an opportunity with one of their official growth rates (and here comes the whole point), you're probably going to miss the party.

So, if you can't depend on market research firms to direct your innovative juices, what's a vendor to do? Well, there was an earlier hint, but I'll repeat it: Ask a few customers what they'd like to buy! Not only does this make for better products (and services), but it's a much lower risk route than chasing the same research-certified, "safe-bet" products as everyone else.

Customers can really help here — and help themselves in the process. Avoid vendors who only want to convince you that they "understand the market." You *are* the market, and it's up to the vendor to understand you.

Stearns has worked as a senior manager at computer and data communications companies and, at one point, headed up an internal market research function. He now works as an independent adviser.



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Finding utility in Windows packages

Windows integration, software offer users more functionality

BY CHRISTOPHER LINDQUIST
CW STAFF

Any software vendor trying to sell millions of copies of a product has to aim for the middle ground of functionality. As a result, some people are always going to find a gap between what they would like the product to do and what it can do. Microsoft Corp.'a Windows is certainly no exception to this rule.

Despite the presence of an "easy-to-use" graphical interface, many users want more: more flexibility, more functionality — and more fun.

It is not surprising, then, that a large number of Windows utility and integration packages have hit the market. They range from simple button bars to full-blown Program Manager replacements with macro recorders, screen savers, task schedulers — even sound effects. Finding a package that does just what you want it to do can be daunting.

To help your search, here are a few recently released products:

• **Norton Desktop for Windows Version 2.0.** Symantec Corp.'a popular desktop integrator and utility package could hardly pack in any more functionality. It includes disk recovery tools, a file finder, macro and batch builders, system information, drag-and-drop support for file deletion and viewing, virus protection, a complete Program Manager replacement, a fully functional backup utility (minus tape drive support) and even an icon editor.

Norton Desktop does almost everything, and Version 2.0 does it without the incredibly annoying performance degradation common with the first release.

• **NewWave Version 4.0.** Hewlett-Packard Co. is repositioning NewWave from a corporate computing and integration platform to an object-oriented desktop manager and utility package. It is certainly one of the more powerful packages out there, but its extremely intuitive interface is countered by a somewhat complex setup procedure. NewWave allows you to manipulate objects and tools. Tools perform some action on objects, such as printing or deleting. Simply dragging an object onto a tool causes the tool to become active. Object names can be up to 32 characters.

While the NewWave interface is very easy to use, creating an application object with the Bridge Builder is a process that novice users will want to avoid. Once set up, the applications are nearly effortless to use, but it will take reading the instruction manual and some practicing to become comfortable at creating objects. One powerful feature of NewWave is its "agent task" ability that automates almost any Windows function.

• **Synergy Version 1.0.** This is the least integrated of the packages, despite its name, but it also includes some of the more interesting utilities. From Synapps Software, Inc., Synergy consists of a button bar creation utility; a sound file player that can use a standard personal computer speaker; Psychic, a utility

Continued on page 38

Windows utilities

Desktop integration packages and utilities for Windows provide services ranging from the basics to all-in-one

Norton Desktop for Windows (Symantec)	$179.00
NewWave (HP)	$195.00
Synergy (Synapps Software)	$129.95
HDC PowerLauncher (HDC Computer)	$99.95
SmartPad for Windows (Softhlor)	$60.00

CW Chart: Tom Monahan

Gillette commits to pen-based project

BY MICHAEL FITZGERALD
CW STAFF

BOSTON — Like the first crocuses of spring, actual pen-based projects poked their heads above ground here at the recent Pen-based Computing Conference.

Gillette's Standish: *Switch to pen technology carefully*

Prominent among them was Gillette Co.'s pilot project, a move to outfit store merchandisers who previously had no computers with Grid Systems Corp.'a GridPad HD. HD is configured with Grid'a proprietary operating system, Penright, a 20M-byte hard drive and NEC Corp.'a V20, an 80C86-compatible processor. Modems are built in for communications.

Gillette has found that pen computing has caused some reengineering of the business process, according to Theodore Standish, director of information systems for Gillette'a North Atlantic Group.

"It'a changing the way we work," Standish said. He said Gillette now receives a great deal of data that it did not have before, such as actual store pricing vs. recommended pricing and much more rapid evaluation of how well promotions work.

Gillette has put the GridPads in the hands of its merchandisers, who work for account managers and are responsible for ensuring that Gillette products, such as Right Guard, are displayed as prominently as possible. They also check on whether products are stocked and help coordinate in-store promotions.

Gillette'a goals were to get stocking plans and information on products, pricing and promotions from the account and sales managers to the merchandisers without using the mail and, in return, to receive field data.

To achieve its goals, Gillette chose Sales Technologies, Inc., a Grid business partner, to build pen-based applications. Standish said that GridPad'a screen can be read either vertically or horizontally, which makes reading forms easier than with the handheld terminals and laptop computers Gillette considered before it began looking at the GridPad in 1988.

The company uses handwriting-recognition features primarily for entering numbers. Standish said adjusting the electronic forms has proved fairly easy.

Currently, some 50 Gillette merchandisers use the GridPads, and Gillette has contracted for 250 more systems from Grid.

Continued on page 37

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COMMENTARY

Jesse Berst

Deciphering Lotus' Notes

We've all been reading about Lotus' Notes during the past year. Unfortunately, many of the stories have been long on foggy generalities and short on technical specifics. Let me explain the underpinnings that make Notes an important product for the '90s.

Why is Notes important? Because it is the bar over which other groupware products must jump. In the past, Lotus has sometimes come up with grand strategies and then tried to find technologies to fit them. In the case of Notes, however, Lotus is building its strategy atop a firm technical foundation.

Notes is an environment for building information-sharing applications on networks. I know, that's still pretty foggy, but stick with me. Notes has four core technologies: security, compound documents, replication and development tools. It is the combination of all four into one product that makes Notes significant — so significant that Borland and Microsoft both have crash projects under way to develop Notes-like functionality.

Because Notes is essentially a way to share a database over a network, its first requirement is robust security. The tools were not available on networking operating systems, so Lotus built them into Notes. Notes features RSA public-key encryption, Access Control Lists, electronic signatures and authentication. In brief, it provides secure communications in a public environment.

Second, the Notes database is document-oriented, not transaction-oriented. It is particularly well-suited for "compound documents," which are documents composed of many kinds of information from many sources. Like any database, Notes can handle structured information. Unlike traditional databases, it is also well-suited for unstructured data such as text and graphics.

Third, Notes is a distributed database, thanks to a feature called "replication." You can create a database on one server, then have that database automatically reproduced on other Notes servers.

During replication, changes flow both ways, so people everywhere can add data simultaneously. For example, a Dallas field sales rep can type in information about his latest sales call to XYZ company. That information will be saved on the local server, then replicated to the home office server.

With Notes, it doesn't matter if the home office sales managers have simultaneously typed in their own comments about the XYZ account. Notes servers compare time/date information when collisions occur. The newest information is given priority, but older information is stored as well.

Information is available to anyone and everyone who needs it, removing information bottlenecks and flattening the organizational structure.

Finally, Notes is a tool that nontechnical people can use to develop applications. It takes a lot of work to set up a Notes system, particularly in a geographically dispersed company. But once it has been set up by experts, nontechnical users can start building applications with only a day or two of training. I've talked to at least a dozen end users who assure me that they build their own Notes applets.

They say Notes is easy to master because it uses two simple metaphors. To get information into the database, you use a Form. To get information out you use a View. There's more to Notes, of course, but those two concepts are enough to allow many users to design and modify their own information-sharing applications.

What kinds of things do people build with Notes? In general, the applications fall into three areas. One type is simple, interactive discussions. With Notes, you can form ad hoc workgroups and brainstorming groups composed of people anywhere in the world. For instance, your Tokyo office could easily team up with your Los Angeles and New York branches to solve a sticky support issue for an international customer.

A second type is reference applications for getting information out to a wider audience. For instance, a human resources department might build a job-posting database.

You might think of the third type as routing applications. When information is input, it can automatically be sent to the specified individuals.

Notes still has plenty of room for improvement. Users tell me they want more direct support networks. They also need more administrative tools, better text searching, better reporting and easier access to other applications.

Despite Notes' limitations, you shouldn't embark on a serious groupware effort without considering it. It is currently the technical yardstick by which you should measure other enterprisewide workgroup products.

Berst is the publisher of Redmond, Wash.-based "Windows Watcher" newsletter, a monthly briefing service for software executives and corporate technology managers.

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Lynn L. Wells
Document Management Representative

When a major health insurer suddenly doubled its customer base, their MIS department quickly predicted disaster. The company's in-house document publishing system was already overloaded. They had to drastically cut the time it took to produce vital documents or risk the company's reputation for customer service. That's when they called Lynn Wells and the Xerox team.

Working together, they saw that merely upgrading equipment to add capacity was not the solution. So they took a fresh approach and completely redesigned the company's document publishing processes. Carefully building on existing systems, they integrated Xerox workstations, software, scanners and laser printers to create a custom publishing network.

Benefit booklets that once took forty-five days to publish now take less than five, a 900% increase in productivity. MICR-encoded checks and claims explanations are being printed and mailed together, saving $350,000 a year in postage. And forms are now created electronically, on demand, reducing costs by 30%.

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Gillette commits to pen-based project

CONTINUED FROM PAGE 35

Gillette is still evaluating various ways to use the information it now has. Standish said Gillette will spend several million dollars to roll out pen computers in the U.S. and will begin pilots in France and Germany.

"The debate isn't over whether we'll roll them out; it's over how fast and what's the benefit we should expect," Standish said.

Standish offered several warnings to would-be designers of pen-based projects.

"Implementation may look really simple, but it's not," he said. "I strongly recommend that you start simple. The technology is new, and pen-based applications are not keyboard applications put on a write-top, so you have to rethink what it is you're trying to do."

He also warned about quick hardware obsolescence.

"It intrigued us that the technology's capabilities could grow, but we didn't anticipate how fast that would happen — it's changing faster than we can depreciate it," Standish said.

Gillette uses a five-year depreciation cycle, and the company now leases its GridPads. Standish added that Gillette has no desire to pioneer use of 80386-based pen systems, such as those that have started to hit the market.

Standish's organization started looking at pen technology in the fall of 1988 and rolled out a prototype in the spring of 1989.

Standish said Gillette's pen project struggled at times. He said one major hurdle was convincing top management that the technology was not a toy.

"We've gone through some significant problems, but [our users] were behind us all the way," Standish said. He indicated that many of the problems came out of issues with learning how pen technology is used.

Standish said Gillette made a point of bringing in the merchandisers before the pilot started to handle training issues.

This paid off in both turning up initial problems with the design and in suggesting some new ideas, he said. In the future, Gillette will consider adding several applications.

Making your PC speak 'pen'

BY MICHAEL FITZGERALD
CW STAFF

Teaching old dogs new tricks is never easy, but some companies are looking to capitalize on a burgeoning pen-based market by making tools that let existing technology work with a pen.

For instance, Redwood Shores, Calif.-based Communication Intelligence Corp.'s PenDOS, which comes bundled with NCR Corp.'s System 3125 and is also sold separately, offers users the ability to run DOS applications in a pen environment. With a new version of PenDOS that supports extended memory management, even applications such as Fox Software, Inc.'s FoxPro database management system can be used in a pen environment without modification.

Another DOS tool

Egad, Inc., a start-up company based in Fairfax, Va., has developed a new product, which it calls The Pad. The 3-pound, 6.6-by-9.9-in. product, based on the PC/Chip from Chips and Technologies, Inc., will use Nestor, Inc.'s NestorWriter DOS pen environment to run DOS applications.

The hardware will feature two Personal Computer Memory Card International Association drives, although the PC/Chip limits it to an IBM Color Graphics Adapter-compatible screen. Six nickel-hydride cells will generate as much as 50 hours of battery life, Egad said.

Bundled with the system will be Digital Research, Inc.'s DR-DOS, Borland International, Inc.'s SideKick 2.0 and Quattro Pro SE spreadsheet. Egad founder James Mundy said he expects systems will range from $750 to $1,999.

CW Chart: Tom Monahan

Egad hopes to license its design to other vendors; IBM and Hewlett-Packard Co. have expressed interest, Mundy said.

Another start-up, Arthur Dent Associates, Inc. in Tewksbury, Mass., announced at the Pen-Based Computing Conference in Boston that it was shipping WriteAway, a product that allows a standard notebook computer to run pen-based applications.

The $595 add-on kit consists of a digitizing screen from Scriptel Corp., a pen attachment and controller card, specialized software and Microsoft Corp.'s Windows for Pen Computing operating environment.

Currently, the product works only with Zeos International Ltd.'s 386+ notebook, but a company official said versions would soon be available for Compaq Computer Corp. and Toshiba America Information Systems, Inc. products, as well as others.

WriteAway already has its first user, Rich's Department Stores, Inc. in Salem, Mass.

Symbol, CA unite for bar-code tools

In an effort to bring bar-code technology from the warehouse to the office, Symbol Technologies, Inc. and Computer Associates International, Inc. said they will combine their hardware and software strengths.

Last week, the two firms announced a development, marketing and sales alliance that is expected to result in bar-code hardware from Symbol that is customized to run CA software. No date for product shipments has been discussed.

Several CA applications have been targeted for bar-code versions so far, including CA's personal computer-based Accpac Plus and Accpac BPI Accounting packages. Both are accounting applications that could be used for order entry. Another candidate for new Symbol hardware is CA-Netman, which inventories a company's own software.

Symbol, based in Bohemia, N.Y., has specialized in bar-code scanners and terminals for retail and niche needs. It recently announced plans for a scanner and computer that is worn by an employee.

JIM NASH

HP to add three 486 systems to PC line

BY MARK HALPER
CW STAFF

PALO ALTO, Calif. — Hewlett-Packard Co. plans today to beef up its personal computer offerings by adding three 1486-based systems with improved video performance and a network-ready 80386SX machine.

The three 486-based systems, called the Vectra 486U series, include one based on Intel Corp.'a 25/50-MHz clock doubler chip, a 25-MHz 486SX and a 33-MHz 486DX. HP also plans a 33/66-MHz clock doubler 486U machine for the fall, which is when it expects Intel to make the 33/66 processor available. Intel's clock doubler runs twice as fast internally as externally.

The three forthcoming 486 systems, slated for June availability, offer faster video performance than HP has provided in the past. The company is installing video processors onto the motherboard and tying them directly into the system bus.

Video is processed at either 25 MHz or 33 MHz, depending on the machine, rather than at 8.33 MHz, as is the case on other HP and competitive machines.

The company claimed graphics performance exceeded that of competitors' PCs by a factor of 10 in a benchmark comparison of 33-MHz models.

The Vectra 486U series 486-level machines round out HP's desktop line, which previously topped out with a 20-MHz 486SX model.

The company will continue to offer its 33-MHz 486DX tower model but is expected to phase out its 25-MHz 486DX tower machine, which, according to sources, has been selling primarily for desktop applications.

HP is implementing a free upgrade program to discourage users from waiting for the 33/66-MHz clock doubler version due later this year. The company will provide an upgrade to the 33/66 chip to customers who buy a slower version before Aug. 31.

HP said the same board serves both 25-MHz and 33-MHz units because the 486U series includes a switch that controls the clock rate. Otherwise, 25-MHz machines could not be upgraded to 33 MHz, the company said.

Standard features include 4M bytes of memory expandable to 64M bytes on the motherboard, 128K bytes of external cache, five Extended Industry Standard Architecture expansion slots, four storage slots, a 1.44M-byte floppy drive, an integrated drive electronics hard disk controller and support for two Small Computer Systems Interface-2 devices.

Prices without hard drives start at $2,999 for the 486SX machine, at $3,499 for the 33-MHz 486DX model and at $4,199 for the 25/50-MHz clock doubler box.

Meanwhile, HP priced its new 25-MHz 386SX-based network-ready machine at $1,149 with no floppy drive and at $1,199 with a 1.44M-byte floppy drive. HP is bundling Microsoft Corp.'a Windows, DOS and a mouse with hard drive versions at prices starting at $1,749 for an 85M-byte model. Availability is scheduled for next month.

HP's PaintJet XL300 brings four-color printing to offices

BY CAROL HILDEBRAND
CW STAFF

The door to widespread color printing in the office creaked open another few inches with the introduction of Hewlett-Packard Co.'a PaintJet XL300.

The four-color, 300-dot/in. printer outputs on a wide variety of media, including office paper. It is the first product to feature the color implementation of HP's PCL 5 printer language. A second version of the XL300 dangles the additional bait of integrating PostScript Level 2 from Adobe Systems, Inc.

The machines are compatible with HP's enormously popular LaserJet series, which the company is touting as an easy transitional effect for people moving to color machines.

The machines are also very network-friendly, with automatic I/O switching for simultaneous connections to personal computer, Apple Computer, Inc. Macintosh and networked environments.

"It's definitely one of the products that will break open the color printer market," said Bill Flynn, a senior market analyst at BIS Strategic Decisions in Norwell, Mass. "It's one of the big elements we've been waiting for."

However, Flynn did point out a couple of drawbacks. The water-soluble inks are susceptible to even such faint moisture as hand perspiration. And at rates of 1 to 2 page/min., the printing speed is on the slow side for a networked office environment, he said.

The PaintJet XL3000 costs $3,495 without PostScript Level 2 and $4,995 with Level 2.

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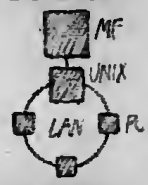

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NEW PRODUCTS

Systems

Hewlett-Packard Co. has announced a version of its HP 95LX palmtop computer that has 1M byte of random-access memory.

The previous HP 95LX had 512K bytes of memory. The enhanced system is priced at $799. Upgrading a 512K-byte model to a full megabyte costs $190.

A 1M-byte add-in card is also offered, for $599.95.

HP
1000 N.E. Circle Blvd.
Corvallis, Ore. 97330
(503) 757-2004

Software utilities

American Megatrends, Inc. has created AMI Diag 4.0, a diagnostic utility.

The product examines personal computer system boards, peripherals and memory, offering a graphical depiction of dynamic random-access memory and single in-line memory module memory inaccuracies.

AMI Diag 4.0 can display a graphic picture of the motherboard, identifying the location of defective chips on the system motherboard.

Version 4.0 has testing functions for both hard and floppy disks, all I/O interfaces, processor speeds and component and keyboard tests.

AMI Diag 4.0 is priced at $149.

American Megatrends
6145-F Northbelt Pkwy.
Norcross, Ga. 30071
(404) 263-8181

Peripherals

Samtron Displays, Inc. has announced the SC-428TX, a 14-in. noninterlaced Super VGA monitor.

SC-428TX supports resolutions ranging from 640 by 480 to 1,024 by 768 pixels and has 0.28mm dot pitch. According to the company, the monitor offers a 43.5Hz to 72Hz refresh rate, synchronized to any frequency within the specified range without end-user adjustment.

SC-428TX costs $599.

Samtron Displays
Suite 101
14251 E. Firestone Blvd.
La Mirada, Calif. 90638
(213) 802-8425

Software applications packages

Sundial Systems Corp. has announced that it will release 32-bit versions of its Relish and Relish Net calendaring applications for IBM's OS/2 2.0.

Relish 32-bit will be priced at $189. Pricing for Relish Net 32-bit, local-area network-based workgroup scheduling will be announced later.

Sundial Systems
Suite 204
909 Electric Ave.
Seal Beach, Calif. 90740
(310) 596-5121

Light Source, Inc. has developed Ofoto, image scanning software for personal computers running on Microsoft Corp.'s Windows environments.

Ofoto automates the scanning process and reproduces gray-scale images with a button touch. An adaptive calibration feature allows users to optimize each scan for the quality and resolution of the specific printer that will be used. Other key features include smart-pixel processing and intuitive image manipulation tools.

Ofoto costs $395.

Light Source
Suite 100
17 E. Sir Francis Drake Blvd.
Larkspur, Calif. 94939
(415) 461-8000

Intex Solutions, Inc. has announced Forecast, a forecasting enhancement designed for Lotus Development Corp.'s 1-2-3 for Windows.

Working within the graphical what-you-see-is-what-you-get environment, the product turns 1-2-3 for Windows into a forecasting system. Users can conduct time series analysis, multiple regression and descriptive statistics.

Forecast for Windows costs $165, plus $5 shipping.

Intex Solutions
35 Highland Circle
Needham, Mass. 02194
(617) 449-6222

Diagnostic equipment

Frontline Test Equipment has released the RS-232 ComProbe interface.

ComProbe is an external device that connects to a personal computer through the parallel printer port. Both synchronous and asynchronous RS-232 data communications testing can be conducted on PCs, notebook computers and laptops. ComProbe is part of the Serialtest 4.0 protocol analysis package.

The complete Serialtest package, which includes ComProbe, is priced at $1,495.

Frontline Test Equipment
Suite 2F
330 Naperville Road
Wheaton, Ill. 60187
(708) 653-8570

Windows packages

CONTINUED FROM PAGE 35

that monitors the opening and closing of files and learns to perform those actions for you; a script generator; a program launcher; an icon editor and a sound and visual effects utility.

Creating button bars with Synergy is straightforward. One nice feature is the ability to create bars that stand alone, attach to specific applications or attach to the Program Manager.

• **HDC PowerLauncher Version 2.0.** This package from HDC Computer Corp. provides maximum power in minimum space and has a "launch box" feature that will be appreciated by users who miss having a command line under Windows. A powerful script generator is but one of the other useful tools provided with the package, which also includes keyboard and mouse remapping and a "virtual screen" utility that allows you to move Windows around an area that is up to 64 times the size of your monitor.

Another nice touch is that HDC's Action Editor can act as an Object Linking and Embedding server, allowing you to insert script commands into documents.

• **SmartPad for Windows Version 1.0.** Softblox, Inc.'s SmartPad lets you create button bars, or "pads," that can be attached to applications. Macros, commands and programs can all be executed with the pads, as with most such products. But SmartPad takes the button- or toolbar approach one step further and allows you to attach customized pads through Dynamic Data Exchange (DDE) links. Using DDE, you can not only attach a pad to an application, but you can have pads appear when certain files, such as a spreadsheet in Lotus Development Corp.'s 1-2-3 for Windows, are used. SmartPad also allows "balloon help" to be created for each pad.

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IBM's OS/2 2.0: Still lacks novice appeal

IBM's OS/2 2.0

Reviewers	Performance	Ease of use	File management	Memory management	Compatibility	Utilities	Multitasking	Value	Overall
Infoworld 4/6/92	Heavy memory requirements	Not as intuitive interface, but easier	Best choice for file server	NC	Does not support Windows 3.1	NC	True multitasking	Close to where it should be	Not most robust, mature OS yet
PC Week 4/6/92	Needs lots of hardware	Superior	NC	NC	Runs Windows applications inconsistently	NC	Works well	May require PC upgrade	Still has some kinks
Windows Magazine 4/92	Good	Lengthy installation	Clever interface	NC	On track	Clunky applications	Useful	Worth a look	Mixed reviews
Users									
Chuck Diedin, American Airlines	Good	Good	Good	NC	Fair	Fair	Fair	Good	Gets a lot more out of a PC
Eugene Magnum, University of Michigan Hospitals	Good	Fair	Poor	Good	Fair	Fair	Fair	Fair	Good compatibility and multitasking
Bruce Wallace, University of Santa Barbara	Fair	Poor	Good	Fair	Poor	Good	Fair	Fair	Sets new standard for OS/2 use
Analysts									
Steven Gillmann, Dataquest Information Systems Group	Good	Poor	Good	Fair	Good	Good	Good	Poor	Market acceptance is key issue
Scott Stein, Technology Investment Strategies Corp.	Good	Good	Fair	Good	Good	Fair	Fair	Fair	Viable platform
Bobby Joe Hall, Mainstreet Data Information Inc.	Poor	Good	Good	Fair	Poor	Poor	Good	NC	"Technically superior"

Key: Very good Good Fair Poor

Reviewer evaluations are excerpts from articles. Refer to actual reviews for details. User and analyst ratings are based on telephone surveys. NC: No comment.

Technology Analysis — A roundup of expert opinions about new products. Summary written by free-lance writer Emily Leinfuss.

Despite efforts to appeal to less expert users, IBM's latest version of OS/2 2.0 did not impress reviewers, who inevitably compared it with Microsoft Corp.'s Windows 3.1. Primarily, the reviewers said, the operating system's new graphical user environment, the Workplace Shell, leaves a lot to be desired. But they added that OS/2 still holds much promise as an excellent 32-bit application development platform.

Performance: The overall performance of OS/2 2.0 is much better on faster, higher capacity machines, although reviewers said performance on lower end systems was quite acceptable for most operations. According to *Windows Magazine*, OS/2 2.0's performance when running DOS programs and supporting Windows applications is also good.

Ease of use: One of the key new features of OS/2 2.0 is its Workplace Shell, which replaces the old group manager. Although *PC Week* said the Workplace Shell is an attractive, object-oriented user interface, it added that the shell needs more work and that "users will face a stiff head wind as they try to unravel its complexities." *Infoworld* criticized the shell's new convention for dragging objects, saying it is ridiculous because it is completely different from Windows.

File management: Despite its shortcomings, the Workplace Shell is said to do a better job of integrating the program and file management functions than Windows. Users can cut and paste and use Dynamic Data Exchange between OS/2 2.0 and Windows applications. Windows icons can also be put on the OS/2 2.0 desktops.

Memory management: A substantial benefit of OS/2 2.0 is its 32-bit flat address space. Because it allows for more than 16M bytes of random-access memory, users may actually benefit directly when using particularly large applications, *PC Week* said.

Even more significant is that OS/2 2.0 lets programmers allocate blocks of memory exceeding 64K bytes because of the onset of large, persistent object-based systems.

IBM's OS/2 2.0 *offers programmers improved support for multiple threads, memory allocation and interprocess communication*

Compatibility: OS/2 2.0 offers superior backward compatibility for running DOS and Windows programs. An extra benefit is that each DOS window in OS/2 2.0 gets a large amount of memory.

Utilities: Applets — small sample applications — are bundled in with OS/2 2.0. These include a rudimentary spreadsheet, text editor, communications program, database and charting program, none of which any reviewers liked. *PC Week* called the database "embarrassingly simple," and *Windows Magazine* said the spreadsheet was "easily the worst ever devised."

On a programming level, however, the system offers improved support for multiple threads, modern memory allocation and interprocess communication facilities.

Multitasking: Although *PC Week* called OS/2 2.0 a powerful 32-bit multitasking operating system and praised the multitasking feature as being preemptive, it warned that when supporting multiple, simultaneous DOS and Windows sessions, performance becomes unacceptable.

Value: For developers, particularly in the DOS environment, OS/2 2.0 is an ideal platform, well worth the investment.

Vendor financial ratings

Analysts	Short-term performance	Long-term stability	Outlook
Wendy Abramowitz, Angus Research Corp.	Fair	Good	Good
Rick Martin, Chicago Corp.	Fair	Fair	Good

IBM reported $64.7 billion in revenue for 1991, a 6% increase and a $2.8 billion loss that represents a 147% drop in profits for the year.

IBM responds

Rob Crawley, spokesman for OS/2:

Ease of use: Brand-new users found the Workplace Shell intuitive and easy to use. But experienced users — not necessarily power users — found it to be a mind stretch at first because there were no pull-down menus on the screen in front of them, just icons. However, once they started to explore and see how the Workplace Shell works, they found themselves becoming more comfortable.

We have added a "start here" icon that opens up a brief explanation of what the Workplace Shell is and how the mouse buttons interact with the Workplace Shell.

Utilities: Our purpose with the applets was to ensure that anybody who purchased the operating system, [whether or not they had] any applications, could be productive as soon as they got the system.

Multitasking: Performance depends on what kind of configuration you are running. If you are running at minimum configuration, you will find degradation sooner rather than later.

Coming up

Borland's first work on dBase DBMS has hit the streets as dBase IV 1.5. Technology Analysis takes a look at the product on June 1.

Dear COMPUTERWORLD Reader:

Of all the alliances we've formed over the past years, the one that elicits the most questions is our recently announced alliance with IBM.

This cooperative venture, which stems from a vision shared by Apple® and IBM about the evolution of enterprise computing, is unprecedented in its scope and magnitude. It consists of five technological initiatives that will have far-reaching effects on many aspects of enterprise computing —today and tomorrow.

To familiarize you with these individual initiatives—and to shed valuable light on the alliance as a whole—Apple is offering a special video, appropriately titled "The Apple/IBM Alliance." In this video, you'll be introduced to the technologies that Apple and IBM are collaborating on and the products that will emerge out of this cooperative effort. And you'll understand in greater depth the potential this alliance has to revolutionize the computer industry, as well as to deliver capabilities that can make your tasks easier now and in the future.

Most importantly, you'll meet key executives of Apple, IBM and Motorola who share their perspectives on what this cooperative venture will mean for you in terms of your enterprise systems today.

In short, our intent in creating the video was to provide you with a conceptual framework with which to view the important milestones that lie ahead.

We're making this video available to the Information Systems community free of charge. To order your copy, call 1-800-635-9550, ext. 804.

We look forward to sharing our insights on this historical venture. We know that once you see the video you'll be as excited about the prospects as we are.

Sincerely,

John Sculley

John Sculley
Chairman
and Chief Executive Officer
Apple Computer, Inc

The Apple/IBM Alliance

To receive a free copy
of the Apple/IBM Alliance video,
call 1-800-635-9550, ext. 804.

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DEC strives to take multimedia past PC

BY MARYFRAN JOHNSON
CW STAFF

In the world of commercial computing, multimedia is often still considered more of a toy technology than a serious business tool. Yet the landscape is shifting as vendors such as Digital Equipment Corp. polish up their multimedia plans.

"We don't see a single 'killer' application. We see the introduction of this new technology into all computing environments," Richard Treadway, group manager at DEC's Western Software Laboratory, said at a recent briefing.

"Customers may not understand what the definition of multimedia is, but they do understand the use of video and audio," Treadway noted.

Now for the network

DEC's basic strategy is to combine current and emerging multimedia products with its own networking expertise, thus moving multimedia beyond the stand-alone environment of desktop computers.

A key piece of DEC's plan is to make these new technologies fit into existing computer environments. Also important is sticking with whatever standards emerge for data interchange, interoperability and application programming interfaces, Treadway said.

To that end, DEC is 1 of 20 major systems and software vendors signed up with the Interactive Multimedia Association, which is struggling to set interoperability standards for multimedia data on networks.

"I agree with DEC's approach," said Pam Bliss, a senior analyst at Dataquest, Inc. in San Jose, Calif. "The ability to integrate all those elements on the desktop is where multimedia is going.

"What is emerging now are the tool kits to create those applications, but it takes a while to build them," she added.

The ability to combine text, voice, graphics and a host of other data types, such as document

Continued on page 44

SystemPro vs. PS/2 Model 95

Compaq, IBM try to best each other's servers; users see few differences

ANALYSIS

BY MICHAEL FITZGERALD
CW STAFF

Far from the thunderstorms of the low-end personal computer market, IBM and Compaq Computer Corp. are basking in the PC server arena, where they sit astride the high-margin end of things.

For now, at least.

The vendors' two systems — Compaq's SystemPro and IBM's Personal System/2 Model 95 — are frequently classified differently, in large part because SystemPro was built to run two processors at the same time and has a drive array feature. But the systems are converging.

The two companies appear to be on a collision course in this end of the market. In what many observers saw as a direct assault on the Model 95, Compaq last year introduced the SystemPro/LT, a scaled-down version of the full-fledged SystemPro aimed at small local-area networks, while IBM last month unveiled a Model 95 that it claimed would outperform the SystemPro.

Similar in nature

"They both get used in LANs, they both lock the customer into vendor-specific upgrades, and they're both modular," said John Dunkle, president of market research firm Workgroup Technologies, Inc. in Hampton, N.H.

And while IBM uses the Micro Channel Architecture (MCA) and Compaq chose the Extended Industry Standard Architecture (EISA), most users say similarities outnumber differences.

"They could be interchangeable in how we use them," said Wesley Bryant, new technologies manager at Nationsbank in Nashville. Nationsbank uses significant numbers of Model 95s and SystemPros.

"They're comparable in our environment," said Hilal al-Hilali, senior section manager of the technology integration center at the First National Bank of Boston. The bank uses SystemPro, the SystemPro/LT and what were IBM's top-of-the-line

Continued on page 46

Multimedia tool debuts

One company that hopes to fill the vacuum of application development tools for Unix-based multimedia is Gain Technology, Inc.

The Palo Alto, Calif.-based software company last week announced general availability of its GainMomentum Version 1.0, billing it as the first object-oriented multimedia application development system for medium to large-scale multiuser computers.

The software currently runs on Sun Microsystems, Inc. workstations but is moving this summer to other Unix platforms from IBM, DEC, Silicon Graphics, Inc. and Hewlett-Packard Co. This fall, Sun will distribute multimedia on-line documentation and training applications on its SPARCstations.

"Gain's technology is new and exciting. It's what everybody else will be offering in three to five years," said Rikki Kirzner, an analyst at Dataquest, Inc. in San Jose, Calif. "But Gain is incredibly overpriced — $20,000 plus heavy royalties for selling [applications] based on it."

GainMomentum is also too sophisticated for "novice users," Kirzner added.

MARYFRAN JOHNSON

Gain Technology's GainMomentum *brings object-oriented multimedia application development to the Unix platform*

NEW DISCRIPTION

By the end of this week Computerworld readers will have spent over **$31.1 Billion** on Information Technology this year – representing nearly half of all IT spending to date in 1992.

COMPUTERWORLD

Novell offers an affordable analyzer

BY JIM NASH
CW STAFF

PROVO, Utah — Novell, Inc. continues to search for the right mix of network management features, price and simplicity in its LANalyzer for NetWare. The hardware-independent software introduced last week is an amalgam of monitoring and analyzing products currently offered by the company.

But before taking on other monitoring and analysis tools in the market, LANalyzer for NetWare must first establish its place among LANalyzer, Novell's high-end, multiprotocol network analyzer; LANtern, the company's network monitoring product; and NetWare Management System, its collection of server-based network management products.

LANalyzer for NetWare decodes all seven layers of transport protocols for all versions of NetWare and for Apple Computer, Inc.'s AppleTalk, Phases 1 and 2. It differentiates itself from the other Novell products by combining some performance monitoring with analysis features and selling for $1,495. The LANalyzer lists for $12,500 to $19,980.

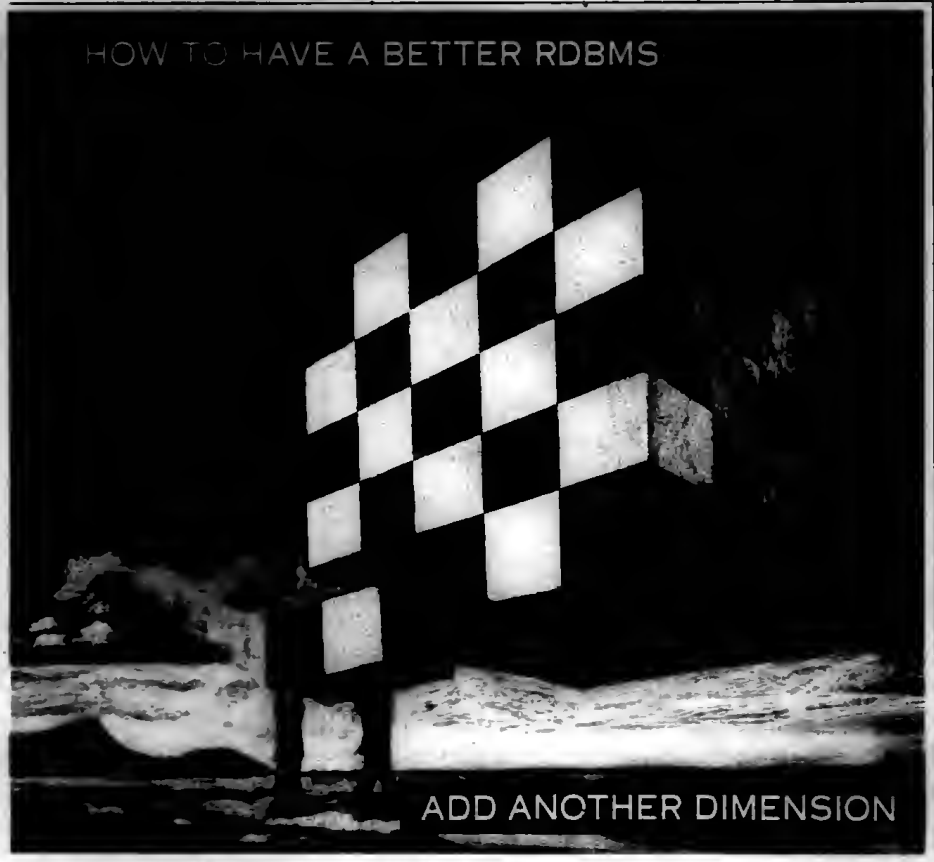
Novell is targeting the new Microsoft Corp. Windows-based software at managers of departmental networks. It is stored on a server and can be called up by a desktop running Windows. Running there, it can monitor events and issue alerts to a manager.

Tony Hunter, manager of information systems at yogurt maker Honeyhill Farms in Concord, Calif., has had a beta-test version of LANalyzer for NetWare for two weeks.

Hunter said that while he has had little use for such software, he sees potential for an inexpensive product that helps identify network problems such as traffic overloads and errors. Honeyhill has about 50 workstations and one Novell NetWare Version 2.2 file server.

"This is a big step" in making a simple, affordable analyzer, according to Jodi Mardesich, an analyst at the Salt Lake City-based consultancy The Burton Group.

Novell's efforts, like those of other players in the analysis market, will continue to be stymied until the process can be simplified further. "You still have to look at [network] packets," Mardesich said, "and most network managers are intimidated by that."



There are a lot of relational data base management systems running on UNIX. Unfortunately, all have one thing in common: They were based on a mathematical premise, not a business premise.

But business needs to manipulate its data differently. Businesses require extra dimensions of flexibility and ease of use.

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DEC strives to move past PC

CONTINUED FROM PAGE 43

imaging, in a multivendor networked environment is in the very early stages of application building, Treadway agreed. There are no cross-platform applications at this point, for example, although a few "bridge" interoperability products are emerging from third-party vendors.

The technical obstacles for networked multimedia applications are substantial. They include the constraints of current network bandwidths and the dual need for higher density storage devices and common data formats. Ten minutes of a TV newscast, for example, would require 27G bytes of storage for uncompressed video and audio.

Not too thrilled

Entertainment, education, training and customer service are the biggest target markets for multimedia, but videoconferencing and document imaging are the best-known applications in today's business environment. Both are expensive options to pursue, users noted.

"I have a hard time getting too excited about multimedia," said Bill Conley, manager of information technology services at Loral Aerospace Corp. in Newport Beach, Calif. "If I were to go to senior management here talking about multimedia, they'd say 'Yeah, what is that really going to do for me?'"

Jack Faricelli, a manager in clinical systems development at SmithKline Beecham Corp. in King of Prussia, Pa., was at DECworld recently, checking out a variety of multimedia offerings. His organization is using a personal computer-based imaging software product for report forms tracking. "We're most interested in using PC clients on our DEC VAXs," Faricelli said.

"I don't see a business base for multimedia yet, although training or customer support are potentials," Faricelli added. "But where can I really use full-motion video?"

The province of British Columbia, another large DEC user, is most interested in integrating multimedia training applications "with what we have now," said Ron Woodward, assistant deputy minister of science and technology at the province's Ministry of Advanced Education, Training and Technology.

"You can't just give a textbook to someone who finished up high school 15 years ago," Woodward said. "You have to use a variety of media to keep their interest and develop the different skills needed for the workplace."

Call 1-800-545-5773, extension 90, for your free copy of "How to Avoid Gateway Chaos in Multiprotocol Networks."

Call 1-800-545-5773, extension 90, for your free copy of "How to Avoid Gateway Chaos in Multiprotocol Networks."

High expectancies for Notes 3

BY ROSEMARY HAMILTON
CW STAFF

Lotus Development Corp. confirmed earlier this month that its Notes support for Apple Computer, Inc.'s Macintosh is being beta-tested at some customer sites and will ship with Version 3 of the workgroup platform.

Add this promise to an already long list of commitments that Lotus has made for the next shipment of Notes in the coming year. Version 3 has a targeted delivery date of year-end 1992, and other features have been promised for early next year.

Despite the heavy development load that Lotus is now carrying, industry observers said they expect the software company will hold to its delivery plans.

"Lotus was burned substantially from delays with 1-2-3 for Windows," said Stuart Woodring, an analyst at Forrester Research, Inc. in Cambridge, Mass. "They aren't going to overpromise now. If they miss delivery dates for users who are wild about this product, that could develop some really bad blood."

The company has sketched out various features for Notes during the past six months and has said they will be available in the next 12 to 15 months. Some items, such as Microsoft Corp.'s Windows New Technology support and a front-end development tool called Notebook, have no target dates.

However, Eric Sall, the company's director of product and applications marketing for Notes, provided a more specific outline for the many other Notes activities that include the following categories:

• **Core functions:** Several features will ship as basic Version 3 components. These include system improvements such as expanding the address book from 25,000 to 250,000 names and the text-retrieval and search function Lotus is working on with Verity, Inc.

David Marshak, a vice president at the Patricia Seybold Group, said Lotus "has gone back to make it into a more robust system."

• **User interface improvements:** Lotus' SmartIcon technology will be plugged into Version 3.

• **Notes add-ons:** Other functions will be shipped in conjunction with Version 3, but they will be offered as add-on products. This includes the work-flow technology that Lotus is picking up from its deal with Action Technology, Inc. Although some code will be built into Notes, the work-flow feature will be sold as a separate application.

• **Concurrent efforts:** Plans such as the CC:Mail and Notes integration are under way with their own schedules and are not tied directly to Version 3's shipment. Another integration component is scheduled for shipment next month.

• **Platform support:** Macintosh support is tied to Version 3. Unix support will also work with Version 3 but will not be available when the software first ships. Instead, it is on the calendar for availability in early 1993.

The Notes promises "will be the test for Mr. Landry, won't it?" Sheldon Laube, national director of information technology at Price Waterhouse, said of Lotus' Chief Technology Officer John Landry's list of Notes plans. "He's made a lot of promises, and I want them to do it."

Notes highlights

Feature	Time frame	Source
Text retrieval and search	Year's end, Version 3	Verity and Lotus
Imaging	June	Kodak and Lotus
Work flow	Year's end, Version 3	Action Technology and Lotus
Macintosh support	Year's end, Version 3	Lotus
Unix support	First half 1993	Lotus
Improved user interface, including SmartIcons	Year's end, Version 3	Lotus
System enhancements, including expanded address book	Year's end, Version 3	Lotus

Source: Lotus Development Corp.

CW Chart: Michael Siggins

Lotus confident

Sall said Lotus sees each of these features as key for its user base and is comfortable with the delivery schedule. "We always watch schedules very closely," Sall said. "I don't believe we are overcommitted."

Laube and other users said they are interested in the text-retrieval and search capabilities that Lotus is plugging into Notes with the help of Verity.

This arrangement is one of several that Lotus is now developing. The future imaging functions will stem from a deal with Eastman Kodak Co., and the work-flow technology is coming from Action Technology.

Industry observers said these deals will work in Lotus' favor by allowing the company to concentrate on core issues while leveraging the skills of partners.

"In some cases, they have very capable outside vendors working with them, which is a good idea," said Richard Stuckey, a partner at Chicago-based Andersen Consulting, which recently signed a Notes deal for 20,000-plus copies. "They clearly can't do this all" by themselves.

Like Price Waterhouse, Andersen is interested in the text-retrieval functions, but it is also focused on the system improvements that should help make Notes more of an enterprise-class platform. "We are particularly concerned with the operational aspects of the system," Stuckey said.

In addition, Andersen has the Macintosh support in-house, and "they seem to have most of their work behind them. It does work," Stuckey said.

10 years of SCSI

BY ELLIS BOOKER
CW STAFF

Happy birthday, "Scuzzy."

A decade after its naming, the Small Computer Systems Interface (SCSI) standard for connecting computers to peripheral devices has grown to a worldwide $6 billion market, with 10.6 million SCSI-based units shipped last year.

Celebrating SCSI's birthday late last month was NCR Corp., which, along with SCSI co-developer Shugart Associates, Inc., proposed the open interface to the American National Standards Insitute (ANSI) on April 26, 1982. SCSI was approved by ANSI in 1986.

Prior to SCSI, adding a new or improved peripheral to a computer generally required adding a specialized hardware or software module to the host machine.

"Virtually every new product developed in the past decade has used SCSI," noted Phil Devin, vice president of storage technologies at Dataquest, Inc. in San Jose, Calif.

The advantage of SCSI for vendors was the ability to rapidly introduce new generations of products, thereby providing the marketplace with "plug and play" simplicity. That was certainly the thinking at Apple Computer, Inc., an early adopter of the standard. The Apple Macintosh used the 5380, NCR's second SCSI protocol chip. NCR's first SCSI chip, the 5385, was introduced in 1983 and now resides at the Smithsonian Institution's *Information Age* exhibit.

Sophisticated appeal

Devin noted that SCSI is still more popular for larger computer configurations — those with more than 200M bytes of storage — that need to connect to multiple subsystems. Smaller and stand-alone computers continue to use less sophisticated AT or integrated drive electronics (IDE) interfaces. The IDE bus also requires less power than SCSI, making it more attractive for laptop makers, Devin said.

The current SCSI standard, often referred to as SCSI-1, specifies a 5M bit/sec., 8-bit bus able to accommodate up to eight ports (seven peripherals and one host port). The nearly codified SCSI-2 standard calls for a "wide" bus of 16 or 32 bits and throughput of 10M bit/sec.

Looking toward the future, Devin estimated that the number of SCSI-based peripherals and controllers shipped — 10.6 million in 1991 — will grow to 13.9 million in 1992 and 29 million in 1995.

SystemPro vs. Model 95

CONTINUED FROM PAGE 43

Model 95s until the firm's recent announcement.

Al-Hilali said that although the Compaq machines provide larger contiguous disk capacity, they otherwise offer little in the way of storage advantages.

IBM and Compaq have been able to maintain prices and margins on the high end because many users say they are less willing to buy clones on the server side. Issues of support and data integrity matter more than a cut-rate price.

Perhaps accordingly, IBM executives have singled out the PS/2 Model 95 as one of the company's few bright spots in the PC market this past year. Compaq's SystemPro, while not a world-beater in terms of unit sales, dominates its category of the market.

Most SystemPro users contacted cited its high-availability features as a major reason for buying it.

"Our No. 1 favorite thing is the fault-tolerant features of the SystemPro," said Glenn Sandusky, chief information officer at Miller Mason & Dickenson, a benefits consulting firm based in Chicago. The firm uses more than a dozen full-fledged SystemPros to run its operations nationwide.

Sandusky cited Compaq's Disk Array in particular "because that's how you get the fault tolerance. I like the fact that if you lose a drive, you're OK. And we've lost them."

Louis Kahn, network administrator at the Immunization Division of the Centers for Disease Control (CDC) in Atlanta, one of the largest SystemPro users, agreed. "We've had failed drives, and I live in fear that if it happens, I'm really in trouble. [With the SystemPro,] I can have two drive failures and not be in trouble," he explained.

The CDC has more than 200 SystemPros installed.

Model 95 users say the near-total modularity of the system is a major plus, though in the next breath most acknowledged that they have not added to their systems.

"What to me is so gratifying on the 95 is its commitment to upgradability," said J. Briscoe Stephens, data and information systems manager at NASA's Earth Science and Applications Division in Huntsville, Ala. "The 95 can go from a 486SX to a 486DX/50, and this is very important to us. We have to look at a four-year life expectancy for the machine."

Bryant said he likes both the SystemPro and the Model 95 — particularly the new Model 95, with its fault-tolerant features and improved data transfer rates.

MCA "always had the capability of being faster, and now they've done it, and that's a positive for me," Bryant said. He also lauded the Model 95's upgradability and the use of a 32-bit Small Computer Systems Interface for direct-access storage devices, which gives the Model 95 the capability to battle Compaq's Disk Array.

Still, Bryant said he thinks both companies could improve. He cited a need for redundant power supplies, built-in hot swap capabilities and improved network management, particularly from IBM.

Bryant gave both companies high marks for service but said IBM "is better positioned" because of its armies of local systems engineers.

NEW PRODUCTS

Data storage

Vermont Research Corp. has developed the K2 Series 1000, a solid-state disk drive for IBM's RISC System/6000 series computer.

The drive attaches directly to the micro channel of RS/6000 workstations and provides I/O rates in excess of 600 operation/sec. Storage capacity ranges from 32M bytes to 1G byte.

The K2 S1000 costs $11,940 for a 32M-byte system, $29,350 for a 128M-byte system, $54,590 for a 256M-byte system and $206,010 for a 1G-byte system.

Vermont Research
Precision Park
N. Springfield, Vt. 05150
(802) 886-2256

Processors

Kingston Technology Corp. has announced memory upgrades for Data General Corp.'s Aviion workstations and servers.

The products are compatible with DG's AV 100, 200, 300 and 400 series workstations, as well as the AV 3200, 4100 and 4200 servers. A 4M-byte upgrade kit costs $1,995, an 8M-byte upgrade costs $2,995, and a 16M-byte kit is priced at $4,995.

Kingston Technology
17600 Newhope
Fountain Valley, Calif. 92708
(714) 435-2600

Local-area networking hardware

Dayna Communications, Inc. has lowered prices on its DaynaPort Macintosh Ethernet Adapters and DaynaStar MiniHub.

The DaynaPort adapters for Apple Computer, Inc. Macintosh systems now cost $239, down from $299. The cards support all major protocols, the company said.

The DaynaStar MiniHub, with 8 RJ-45 jacks and one BNC connector for backbone attachment, is now priced at $389, reduced from $449.

Dayna Communications
50 South Main St.
Salt Lake City, Utah 84144
(801) 531-0600

Peripherals

Fujitsu Computer Products of America, Inc. has created the VM2200-SRS Workstation PrintPartner for Sun Microsystems, Inc. computing environments.

The VM2200-SRS offers 22 page/min. print speed and direct Small Computer Systems Interface (SCSI) connectivity. It includes a 250-sheet bin, with optional 250- and 1,000-page second bins available. The SCSI interface allows high-volume printing with 5M byte/sec. data transfer, the company said.

The product is available immediately and costs $9,995.

Fujitsu Computer Products of America
2904 Orchard Pkwy.
San Jose, Calif. 95134
(408) 432-6333

Micro-to-micro

Microlynx Systems Ltd. has announced FastFX, a high-speed add-in card.

Designed to give personal computers error-free communications capabilities at speeds of up to 56K bit/sec., FastFX comes with software drivers and an I/O card equipped with an RS-232 interface. Four direct-memory access channels and eight interrupt lines provide flexibility, the company reported.

FastFX can be used over regular telephone networks, switched high-speed digital networks, satellite networks and private networks.

FastFX costs $249.

Microlynx Systems
Suite 172
6815 8th St. N.E.
Calgary, Alberta T2E 7H7
(403) 275-7346

Local-area networking software

Applied Engineering has created ShadowLAN.

ShadowLAN allows Apple Computer, Inc. Macintosh users to share modem and printer ports with other Macintoshes on an EtherTalk or AppleTalk network. Port-sharing is enabled or disabled via a simple software procedure. Shared ports can be protected by password access.

ShadowLAN costs $149. Additional users can be added to the basic package for $49 per five-user set.

Applied Engineering
3210 Beltline Road
Dallas, Texas 75234
(214) 241-6060

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Before you migrate to think about how

Without the right tools, migrating to a new e-mail system could be very bumpy.

Although downsizing from a host to a LAN-based e-mail system can indeed provide significant long-term savings as well as increased user productivity, it's just not going to happen that way if you have not planned for it carefully.

So how do you guard against this? Well, for one, make certain you choose a vendor who can provide a clear migration plan, along with the understanding that downsizing is a gradual process and not something that'll happen overnight.

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Microsoft Mail [Send Note]

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To: Microsoft

Subject: I Want The Migration Solutions Paper

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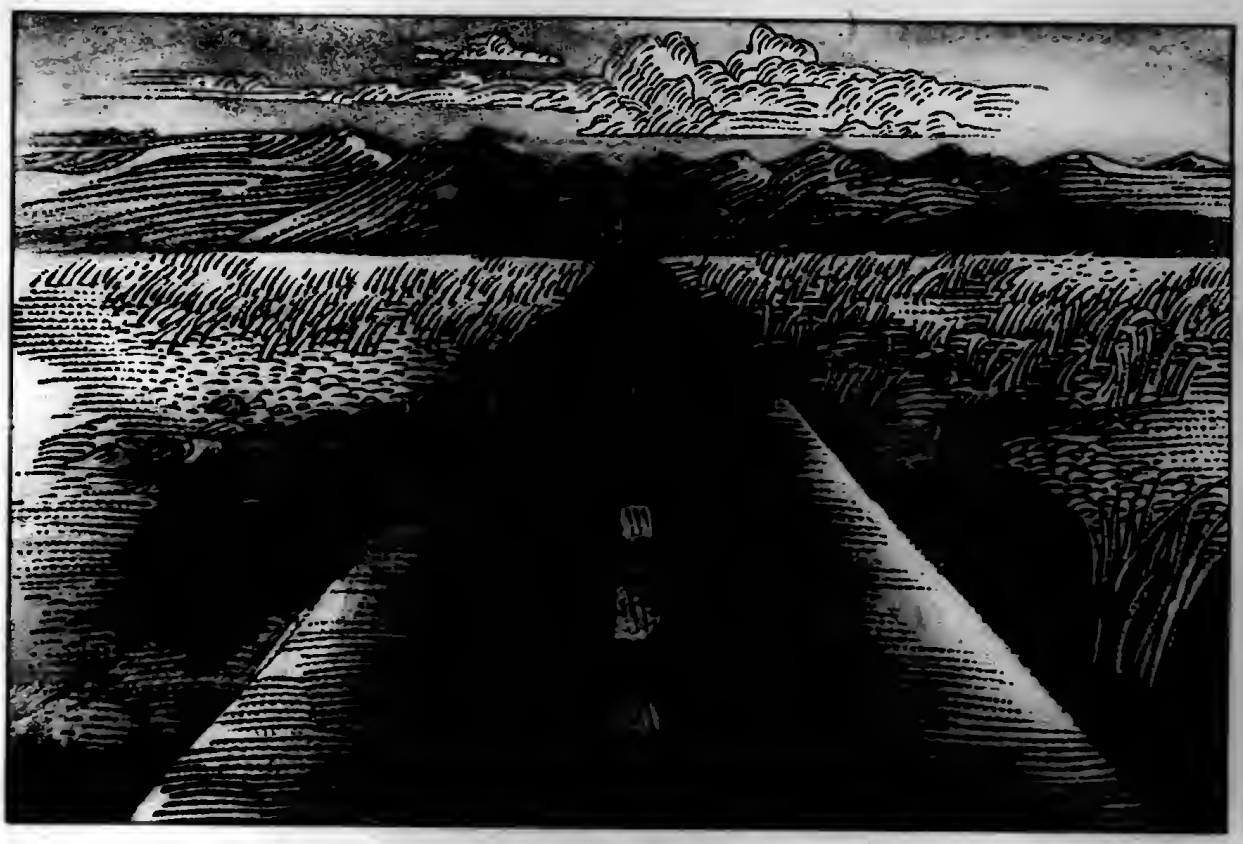

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X.400 software promises low-cost links

Isocor's Lite package said to eliminate expensive X.25 lines at small sites

BY JOANIE M. WEXLER
CW STAFF

LOS ANGELES — In a development that could soon deliver the Open Systems Interconnect protocol for messaging to the personal computer masses, start-up Isocor recently rolled out a version of X.400 software for PC local-area networks.

The firm's $2,450 X.400 Lite package is said to preclude corporate branch sites and smaller organizations from having to pay for expensive X.25 lines — an X.400 requirement today — to use the international standard for messaging. Instead, the software allows them to use asynchronous modems and the public telephone network to transport messages, mail-enabled applications and business documents via electronic data interchange (EDI) among their LAN servers, explained David Knight, Isocor's associate vice president of marketing and sales.

Technological incentive

That capability could provide an incentive to firms looking to swap electronic documents with growing numbers of business partners to make broader use of EDI technology, according to Judith Rosall, electronic messaging program manager at International Data Corp. (IDC), a research firm in Framingham, Mass.

"Certainly for domestic remote sites that want to use X.400, asynchronous dial-up lines are more cost-effective," Rosall said.

Knight said 4.8K bit/sec. leased lines from business partner U.S. Sprint Communications Co. run from $300 to $1,500 per month. Compression techniques allow X.400 Lite traffic to run at 56K bit/sec. less expensively, he said.

An IDC study released this month indicates that the need for integrating electronic mail with other applications is rising on user priority lists. A majority of 100 Fortune 500 firms interviewed by IDC cited X.400 as their preferred method of mail/application integration. Forty-two percent of the firms indicated they plan to deploy X.400 interconnections within the next two years, according to the report.

"Clearly, X.400 as an inter-enterprise standard has taken on a central role for most large organizations," agreed Mike Cavanagh, executive director of the Electronic Mail Association, a 340-member-company organization based in Arlington, Va.

Isocor and some independent software vendors are developing interfaces to X.400 Lite for LAN E-mail formats; Isocor has already released the first such interface for Novell, Inc.'s NetWare Message Handling Service. Later this year, Knight said, Isocor will support other application programming interfaces, such as the multivendor Vendor-Independent Messaging, Microsoft Corp.'s Messaging Application Programming Interface and Apple Computer, Inc.'s Open Collaborative Environment.

DELIVERY OF THE OSI messaging protocol for the PC masses may be on the horizon.

Knight also said Isocor has signed a deal with a PC communications vendor that will allow Isocor products to run over very high-speed links, including Integrated Services Digital Networks, frame relay, Ethernet and Token Ring networks. Today, users with proprietary LAN mail packages, such as Da Vinci Systems Corp.'s EMail, Beyond Mail, Inc.'s Beyondmail or Lotus Development Corp.'s CC:Mail, can allow front-end access to an X.400 Lite server, Knight said.

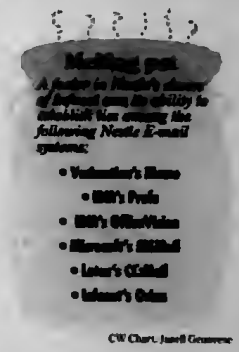
Nestle to blend E-mail systems into corporate net

BY ELISABETH HORWITT
CW STAFF

VEVEY, Switzerland — In order to respond more quickly to changing market demands and customer needs, Nestle SA is setting up what is, in effect, its first corporatewide data communications network. To this end, the international food company recently signed up Infonet Services Corp. to provide electronic-mail and data communications services across sites in 80 countries.

"When I took over my job here two years ago, I found that Nestle, strangely enough for such a large company, had no network," said Jean-Claude Dispaux, the firm's senior vice president of information systems and logistics. While Nestle did have E-mail connections between its Swiss headquarters and major offices in the U.S. and the UK, "E-mail existed at Nestle only in pockets," Dispaux said. "Connection was clumsy, and total use extremely low."

Such limited intersite communications had worked as long as Nestle remained "a federation of local companies that manufacture what they sell locally, but that is quickly changing," Dispaux said.



CW Chart: Janet Gennette

Europe is becoming a unified market, with many supermarket chains expanding across the European continent rather than staying national, Dispaux said. A similar market unification is happening across the U.S. and

Continued on page 77

Ryland ties proprietary platforms into backbone

BY JOANIE M. WEXLER
CW STAFF

COLUMBIA, Md. — A $2 billion real estate and mortgage company has compromised between the high-speed benefits of fiber and the expense of industry-standard Fiber Distributed Data Interface (FDDI) networks in the riser backbone traversing its new headquarters building here.

The Ryland Group, Inc. constructed a combination multiplexer/router backbone to carry traffic from proprietary computer platforms alongside local-area network traffic among the nine floors of its network, which went live last week.

The $1 million network infrastructure includes multiplexer and smart wiring hub gear from Fibermux, Inc. in Chatsworth, Calif., a high-end bridge/router from Bedford, Mass.-based Wellfleet Communications, Inc., fiber cabling in the backbone and unshielded twisted-pair wiring from the backbone out to individual desktops.

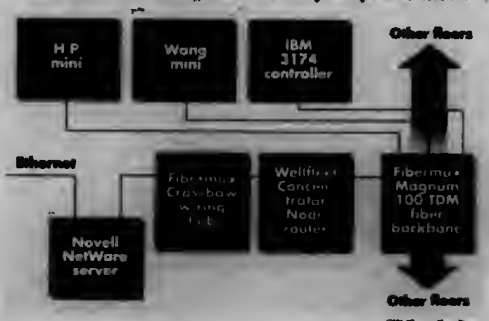
Expensive connection

Like an FDDI LAN, the backbone is fiber, runs at 100M bit/sec. rates and is configured in a dual, counter-rotating ring for backup protection. However, Ryland decided it did not yet have the bandwidth-hungry applications to justify the still-hefty FDDI connection prices, said Carl Setzer, project manager of network services at the firm.

Setzer estimates that the FDDI connections would have made the backbone three times more expensive than his multiplexer backbone because of the many FDDI interfaces that would have been required in the router.

Ryland's riser network

A non-FDDI 100M bit/sec. fiber backbone allows the real estate firm to consolidate non-LAN traffic on its nine-story headquarters network



CW Chart: Guy Stuart

In addition, an FDDI router or bridge would necessitate that proprietary platforms such as Ryland's Hewlett-Packard Co. and Wang Laboratories, Inc. minicomputers and an IBM 3174 cluster controller be outfitted with protocols to allow them to sit on LANs, Setzer said.

Putting Transmission Control Protocol/Internet Protocol (TCP/IP) on those platforms "might have added a couple hundred thousand dollars to the project," he said.

In addition, "we're not convinced FDDI is the wave of the future for everyone. Its token-passing scheme means you never know how long one station will keep the token," which results in delays that are not amenable to voice, Setzer said.

Instead, a Fibermux Magnum 100 TDM time-division multiplexer concentrates the firm's Ethernet LAN, 3270 and minicomputer traffic onto a 100M bit/sec. fiber backbone. Because only LAN traffic can be wired through Fibermux's Crossbow hub and internetworked through Wellfleet's Concentrator Node router, however, "this doesn't do a lot for interoperability," in that the non-LAN traffic stays separate, said Dave Passmore, vice president of local-area communications service at Gartner Group, Inc., a consulting firm in Stamford, Conn.

The scheme does eliminate parallel wiring structures for different traffic types, Passmore added, but "the downside is that you're only operating [over the backbone] at Ethernet speeds, though you have 100M bit/sec. of bandwidth available."

Continued on page 80

COMMENTARY

Eli S. Lurin

Cable TV coming to MAN market

The first, or fiber-based, wave of metropolitan-area network (MAN) carriers has firmly established itself, to the delight of large corporations that are using such alternative services to complement and back up local exchange carrier links of alternative carriers for downtown sites.

Now the next wave, cable TV companies, seeks to establish a beachhead in major metropolitan areas — offering the promise of even greater advantages for corporate users.

For several years, companies such as The Teleport Group, Metropolitan Fiber Systems and Eastern Telelogic Corp. have been aggressively competing against the regional operating companies for large customers in the downtown core of metropolitan areas. They have installed their own fiber-optic networks and provided their customers with leased-line services with up to T3 speeds.

MAN services are used for applications such as LAN-to-LAN connections, high-speed data and multiplexed voice. Many companies use alternative carriers as backup facilities in case of failure on the local exchange carrier's network.

That competition pushed local exchange carriers to put down dual fiber links of their own and may even have accelerated the phone companies' rollout of high-speed services such as Switched Multimegabit Data Service.

Quality concerns

Cable TV companies are the "wild card" in this market. On one hand, unlike the MANs, they are wired (with broadband communications links) throughout the suburbs. Although the present quality of cable TV circuits falls below that of data networks, the cable TV companies are addressing this problem by rewiring with fiber-optic media.

On the other hand, the cable TV companies are not accustomed to providing high-quality data communications, and they do not have the network control systems, technical support or marketing force to provide high-quality broadband services to IS departments. Although there has been much talk about cable TV companies competing with the local exchange carriers, it's difficult to imagine their going it alone in this market without a major restructuring.

However, cable TV companies do have the option of teaming up with the independent MANs. The cable TV companies can provide the broadband fiber-optic cables in the suburbs, where the MANs do not have coverage.

The MANs can provide the data communications sales and support and their expertise in operating high-quality data networks.

This type of alliance is already beginning to happen. For example, Cox Cable and Tele-Communications have taken strong investment positions in Teleport. If such teams become the norm, a potentially three-way race would become two-way again: the local exchange carriers against a far more powerful set of competitors.

THAT COMPETITION pushed local exchange carriers to put down dual fiber links of their own and may even have accelerated the phone companies' rollout of high-speed services such as Switched Multimegabit Data Service.

To make it even more interesting, the MANs recently persuaded the regulators to grant them right of equal access to local exchange carriers' network facilities. This means the MANs can offer their customers the same access to statewide and interexchange networks that the local exchange carriers now offer their customers — at comparable prices.

What about users in IS departments? Will they provide the market needed to pay for these services? A report published by Frost & Sullivan, a New York-based market research firm, says yes.

The report found that users are very interested in a large range of MAN applications, including LAN-to-LAN connections, backup network facilities, full-motion video, image transmission and host-to-PC connections.

Corporate telecom managers should not hesitate to approach their local MAN or even their local cable TV firm with requirements that the carrier does not currently offer, such as a network extension to a suburban area from a MAN. These companies are anxious to meet new needs and to show that they can react to customer requirements.

Lastly, don't count the local exchange carriers out. They are aggressively expanding their offerings, and the increased competition is beginning to do away with their traditional, smug, "we don't care because we don't have to" philosophy.

Lurin is president of Eljan, Inc., a consultancy in Great Neck, N.Y.

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INTERNATIONAL DATA CORPORATION

White Paper

OBJECT TECHNOLOGY:
A KEY SOFTWARE TECHNOLOGY
FOR THE '90s

Introduction

Object technology is revolutionizing the face of computing. In terms of productivity and cost-effectiveness, its potential is staggering. At least one early implementation performed under favorable conditions resulted in a 14:1 ratio of productivity improvement.

As the emphasis changes from hardware to software, object technology — including object-oriented programming, object-oriented analysis and design, object-oriented database management systems and object-oriented application interoperability frameworks — is coming to the fore.

This trend is manifesting itself as a rapidly growing demand for object-oriented training and consulting. The demand is so strong that some training firms are actually doubling or even tripling their staffs to keep up. A recent spending survey conducted by IDC reveals that almost half of 1,600 respondents are becoming involved with object-oriented technology despite the cost of implementing it.

The reuse of standard software building blocks is integral to object technology. Just as hardware is assembled from pretested components, which are used repetitively to design and construct even larger assemblies, software too can now rely on pre-existing code through the use of object technology. For example, there are object-oriented programming languages with special libraries of reusable components especially for graphical user interfaces.

The primary benefits of object-oriented programming are improved reliability and enhanced programmer productivity. Other benefits include clarity and the opportunity to model applications in a more natural way. The hierarchical structure of object-oriented programming makes programs easier to design and understand.

Object technology is a powerful driving force behind the creation of less expensive, more productive software. Its place in the computing firmament is well-established and growing rapidly.

This White Paper was written independently of the *Computerworld* editorial department by Steve McClure, Senior Consultant, New Software Technologies, at International Data Corporation. For more information on the content of this White Paper, or for information on International Data Corporation, please call 508-872-8200. For more information on the White Paper Program, please call 508-879-0700.

OBJECT TECHNOLOGY: A KEY SOFTWARE TECHNOLOGY FOR THE '90s

THIS IDC WHITE PAPER IS ABOUT A SOFTWARE METHODOLOGY THAT IS STEADILY MOVING INTO THE MAINSTREAM. IDC BELIEVES IT WILL BE ONE OF THE MOST FUNDAMENTAL SOFTWARE TECHNOLOGIES OF THE 1990s. THE SUBJECT IS OBJECT TECHNOLOGY, A TERM THAT ENCOMPASSES SUCH THINGS AS OBJECT-ORIENTED PROGRAMMING, OBJECT-ORIENTED DATABASE MANAGEMENT SYSTEMS AND OBJECT-ORIENTED ANALYSIS AND DESIGN. ■ MICROPROCESSORS AND THEIR UNDERLYING INTEGRATED CIRCUIT TECHNOLOGIES CREATED A REVOLUTION OF EPIC PROPORTIONS IN THE INFORMATION PROCESSING INDUSTRY DURING THE 1980s. THE ABILITY TO PRODUCE LOW COST, HIGHLY RELIABLE HARDWARE, REPETITIVELY AND EFFICIENTLY, FUELED THE DRAMATIC RISE OF PERSONAL COMPUTERS AND WORKSTATIONS. THE PRODUCTION OF SOFTWARE, MEANWHILE, HAS NOT KEPT PACE. ■ THE DEVELOPMENT OF SOFTWARE APPLICATIONS, IN TERMS OF COST AND QUALITY, HAS IMPROVED AT A BARELY DISCERN-

ible rate. This is changing. Hardware costs are a rapidly declining part of the overall cost of providing business solutions. Attention is now focused on programming, application development and maintenance. Ways are being sought to position software technology so that application solutions can be produced more rapidly, at less cost and with higher quality. The technology with the greatest promise of achieving this is object-oriented programming (OOP) and related disciplines. This promise exists because object technology supports the reuse of standard software building blocks.

It is appropriate to compare OOP with hardware development. Hardware is assembled from pretested components, which are used repetitively to design and construct even larger assemblies, themselves reusable. The quality of each level of design is insured by pretesting. The error-free assembly is insured by interface standards that focus on the behavior/functionality of each component at its interface.

These same concepts are being extended to software and application development through the use of object technology. Tools are beginning to appear that support object-oriented design and analysis. There are OOP languages, with special libraries of reusable components, especially for graphical user interfaces. And there are object-oriented database systems. All of them are intended to deliver the promise of object technology.

DRAMATIC SUCCESSES

Any IS professional who has been on the job for more than six months is skeptical of anyone suggesting that large potential benefits will accrue simply by embracing a new technology. Wasn't that what Computer-Aided Software Engineering (CASE) products were supposed to do? And why should we accept the counter-intuitive idea that software is analogous to hardware? Some organizations have begun collecting metrics while evaluating new software technology. Electronic Data Systems Corp. (EDS) has done this for object-oriented programming.

EDS performed a carefully structured study of OOP using Smalltalk and an object-oriented database management system to replicate an existing manufacturing application. The application, a maintenance management system, had recently been implemented using PL/1 and a relational database. The system engineers from that project were still available and had kept sufficient records to allow a comparison. They also acted as the "user surrogate" for the Smalltalk team, which was brought in from the outside.

EDS took great pains to keep the skill level of the two teams comparable. The Smalltalk team worked from the same 300-page functional specification used by the original PL/1 team. The study measured the implementation effort from design through test. The original test plans and test suites were used to insure that all functions were implemented. This was a study, so the resulting system was never deployed. However, there were dramatic results; a 14:1 increase in design and programming productivity was shown.

It is important to realize two things about these gains. First, there was no object-technology learning curve. The Smalltalk team was experienced. Second, the functional specification used had been derived using traditional decomposition techniques, not object-oriented analysis and design. Even in this carefully controlled context, these numbers seem too good to be true. They seem outrageous.

The natural inclination is to assume that despite EDS's efforts, something biased the outcome. That is not the case. Instead, we are witnessing the result of a paradigm shift. A paradigm is a way of viewing the world. Alan Kay, the developer of Smalltalk, is fond of saying that the ability to change one's point of view (paradigm) is worth 35 IQ points. An example would be learning to multiply Arabic numbers instead of Roman numerals. Proponents see OOP as a paradigm shift with similar benefits.

OBJECT TECHNOLOGY INTEREST RISING

In the past 16 months, the demand for training and consulting for object-oriented analysis and design has gone from healthy to explosive. Training firms are scrambling to double or triple the size of their staffs in order to keep up with the demand. This rapid rise in interest in object technology is also reflected in recent IDC spending surveys. In its most recent survey, IDC finds that almost half of the 1,600 respondents are becoming involved with object technology. Users were asked to characterize their use of object-oriented databases and languages in the next 12 months.

Overall, 26.8% describe their site's use of object-oriented databases or languages as exploratory, and 21% as significant. The highest projected use is at sites whose senior systems are IBM machines. There, 42% say their use is exploratory and 18% say it is significant. While this question is limited to languages and databases, it does reflect the rising level of interest that will also drive the related markets for tools, training and consulting.

BIG PROJECTS, BIG SAVINGS

NobelTech Systems AB, formerly Philips Elektronikindustrier AB of Sweden, is a leading developer of command and control systems for the Swedish defense services. The company

When Electronic Data Systems conducted a study of object-oriented programming using Smalltalk and an object-oriented database management system to replicate an existing manufacturing application, it realized an increase of 14:1 in productivity.

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also develops real-time systems for several international markets. Its FS 2000 software system is an embedded shipboard command, control and communications application.

It supports a wide range of naval platforms and is being implemented on five ships from five countries. The electronics systems must be on a par with the complexity of those on much larger ships while enabling a small crew to control the operations. The varied requirements of the individual ships call for a well-engineered, flexible software design and architecture. For some projects, the ships must also be multi-configurable depending on operational needs, thus requiring the software to be highly adaptable. The complete FS 2000 system contains approximately 1.5 million lines of code for each ship. The software for each system comprises 150-600 programs. All this software creates an ideal environment for implementing object technology.

The OOD Approach

Early in development, NobelTech took an object-oriented design (OOD) approach to the architecture of the FS 2000 system. Later the firm used object-based programming to implement it. The implementation language chosen in 1986 was Ada. NobelTech selected an OOD approach because OOD enabled the design team to model the overall shipboard system more accurately and to ensure an optimal level of modularity and flexibility. OOD also supported NobelTech's long-term strategy of developing common, reusable software subsystems for future applications.

Working with a team of consultants from Rational Consultants of Santa Clara, Calif., the company developed a methodology that focused on the prototyping of software designs and an incremental integration of software subsystems. This focus enabled the development team to emphasize system-level design considerations and to detect architectural flaws early in the development process. Its approach also promoted a rapid maturation of critical interfaces throughout the software system.

The first ship system has been delivered, with systems two through five in development. Software productivity on the first system was more than twice that of NobelTech's historical average.

More importantly, NobelTech's subsequent projections show that productivity should improve by more than 600% for the remaining shipboard installations. Most of this improvement results from the high degree of software reuse attained, nearly 70%.

Historically, NobelTech had consumed about 40% of its development in the integration phase of projects. By using OOD, and increasing its efforts in the design phase, NobelTech reduced the time required for integration by more than half. This reduction in integration time translates directly into additional cost savings and quality improvement, because of the lower cost and reduced impact of finding and fixing errors earlier in the development process.

In attributing the cost savings for this project, NobelTech considered reuse, OOD and Rational products. Assuming reasonably that up to half of the reuse gains come from OOD/OOP (the other half coming from good architecture and good programming), the use of OOD/OOP has the potential to save this project between $39.9 million and $77.8 million during its seven-year life.

BENEFITS OF OBJECT-ORIENTED PROGRAMMING

The primary benefits of object-oriented programming are improved reliability and enhanced programmer productivity. Reliability is improved because each object is a "black box" to the external agents with which it communicates. The internal data structures and methods can be refined without impacting other sections of code. Traditional programs, in contrast, sometimes exhibit unanticipated side effects when a remote section of code is changed. The environments in which software must run have become exceedingly complex. There are graphical user interfaces, dynamic data interchanges and remote database accesses. OOP is a way for programmers to cope with this complexity.

Programmer productivity is enhanced because classes of objects are reusable, i.e., each subclass or instance of an object can use the program code (methods) for the class. Programmer productivity is also enhanced by the more natural correspondence of program objects to the objects in the domain of the business application under development. Once the paradigm has been learned, application development is shortened, application developers can bring their products to market sooner and IS professionals can respond more quickly to user demands.

Other benefits are clarity and the opportunity to model applications in a more natural way. Because data and programs are stored together, object-oriented programs are easier to understand. The hierarchical structure of object-oriented programming is a natural way to represent many objects in the real world because successive layers present increasing levels of detail. This makes programs easier to design. It also makes programs easier to understand, a bonus for persons who must later maintain them.

ISSUES TO PLAN FOR

The major shortcoming of OOP is purported to be performance relative to tra-

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Key Concepts of Object-Oriented Programming

The way to tackle the design of a skyscraper is to break it down floor by floor and subsystem by subsystem. Decomposition is nothing new. It is the basis for structured design methodologies that have been taught for over a decade. In object-oriented analysis and design, the primary emphasis is on classes and objects, in contrast to structured analysis and design, where the primary emphasis is on process-oriented functional decomposition. In object-oriented analysis, the emphasis is on data.

It is easier to model various aspects of any domain under study if we isolate essential details and discard less useful details. This natural inclination is called abstraction. When we think about a car, we don't think about every last detail that describes the car. Rather, we probably envision the major physical features (body, wheels) and a few of the major subsystems of the car like the drive train, steering and braking systems. Similarly, it is easier to control behavior if it is combined with the data structures to which it most often relates.

Object-oriented program development employs a bottom-up approach. Its basic premise is that during the life of an application, data structures remain relatively stable while the operations on those data structures change depending on particular situations. Thus the procedure is to first identify data structures that write small programs (procedures) for the operations on each data structure, and combine those into the objects that encapsulate the data structures with the procedures.

"In object-oriented analysis and design, the primary emphasis is on classes and objects, in contrast to structured analysis and design, where the primary emphasis is on process-oriented functional decomposition. In object-oriented analysis, the emphasis is on data."

Finally, developers combine the objects into working programs in which work is accomplished by objects passing messages to each other. An object is activated by receiving a message specifying a behavior, and parameters to describe the behavior. After an object executes the behavior, it sends a message to another object.

This approach is the antithesis of structured programming popularized during the last two decades. Large numbers of programmers and analysts have been training in structured programming.

The key concepts of OOP are:

Objects — The basic building block of a program is an object. Objects are software entities. They may model something physical like a person, or they may model something virtual like a checking account. Normally an object has one or more attributes (fields) that collectively define the state of the object; behavior defined by a set of methods (procedures) that can modify those attributes; and an identity that distinguishes it from all other objects. Some objects may be transient, existing temporarily during the execution of a program, i.e., only during run time. Others may be persistent, existing on some form of permanent storage (file, database, programming library) after the program finishes.

Encapsulation — This concept refers to the hiding of most of the details of the object. Both the attributes (data structure) and the methods (procedures) are hidden. Associated with the object is a set of operations that it can perform. These are not hidden. They constitute a well-defined interface — that aspect of the object that is externally visible. The point of encapsulation is to isolate the internal workings of the object so that, if they must be modified, those changes will also be isolated and not affect any part of the program.

Messaging — One object requests another object to perform its operations through messaging. The client object sends a message to the server object consisting of the identity of the server object, the name of the operation and, in some cases, optional parameters. The names of the operations are limited to those defined for that object. For example, the operations for a checking account object may be defined to be OPEN, DEBIT, CREDIT, COMPUTE INTEREST, ISSUE STATEMENT, SCHEDULE AUDIT AND CLOSE.

Data Abstraction — An object is sometimes referred to as an instance of an abstract data type or class. Abstract data types are constructed using the built-in data types supported by the underlying programming language, such as integer and date. The common characteristics (both attributes and methods) of a group of similar objects are collected to create a new data type or class. Not only is this a natural way to think about the problem domain, it is a very efficient way to write programs. Instead of individually describing several dozen instances, the programmer describes the class once. Once identified, each instance is complete with the exception of its instance variables. The instance variables are associated with each instance, i.e., each object; methods exist only with the classes.

Inheritance — Data abstraction can be carried up several levels. Classes can have superclasses and subclasses. In moving to a level of greater specificity, the application developer has the option to retain some attributes and methods of the superclass, while dropping or adding new attributes or methods. This allows greater flexibility in class definition. It is even possible in some languages to inherit from more than one parent. This is referred to as multiple inheritance.

ditional third-generation languages. Similar concerns are expressed when comparing the performance of object-oriented database management systems (ODBMS) with specialized file systems In the EDS example mentioned above, a response-time test showed that the Smalltalk implementation was twice as slow (30 vs. 15 seconds), as the existing application. Performance is degraded by the dynamic binding of methods to the data structures at run time.

Some object-oriented languages, e.g., C++, do support compilation, which improves performance at the expense of flexibility and ease of maintenance. The database concerns are analogous to those in the early years of relational databases when hierarchical databases were known to perform better. The performance of ODBMSs has improved markedly in the past two years, and will continue to improve

Productivity gains from program modularity and reusability can be difficult to achieve. Programmers, faced with a large complex system, can be challenged to find the appropriate objects and to select the proper method or to identify the optimum method. Smalltalk, for example, includes 5,000 methods in its programming environment. Tools are needed to help programmers make these choices. There is also a steep learning curve for traditional programmers. The lack of any standard object-oriented development methodology is also a problem.

MULTIPLE FORMS OF OBJECT TECHNOLOGY

Object technology is not just OOP. There are several areas where object technology is making its presence felt. The major ones are:

- Object-oriented analysis and design (OOAD)
- Object-oriented programming and development environments
- Object-oriented database management systems
- Object-based application interoperability frameworks.

There are many who feel that object-oriented programming is going to displace structured analysis and design. Some feel it will negate the need for analysis and design altogether because developers will prototype their applications, drawing upon a rich set of class libraries. Unfortunately, both views are misguided.

The point of analysis and design, whether structured or object-oriented, is to deal with complexity by applying principles like decomposition and abstraction in a methodical way. There are elements of the traditional structured methods, such as entity-relationship diagrams and data flow diagrams, that can contribute to object-oriented analysis and design.

Many methodologists agree that there are three basic aspects of a software design: data, process and control. Data is the information content of the system, what is being processed and stored. Process is the algorithms, rules and operations performed on the data. Control is the determination of when or under what conditions the processes are performed.

In object-oriented analysis the emphasis is on data. Sally Shlaer and Stephen Mellor have summarized the different orientations.

Four major methodologies for OOAD include:

- Shlaer and Mellor: Object-Oriented Analysis, Object-Oriented Design Language, Recursive Design
- Coad and Yourdon: Object-Oriented Analysis
- Rambaugh et. al. (GE): Object Modeling Techniques
- Booch: Object-Oriented Design.

These are worth serious consideration because their proponents have written books that explain the methodology, and there is consulting and training available from the authors or from third parties. An additional reason is that there is at least one CASE tool available to support each methodology. There are also other significant methodologies. Objectory from Objective Systems of Sweden supports Jacobson's methodology Interactive Development Environments of San Francisco is promoting an object-oriented, structured design methodology developed by its president, Tony Wasserman.

Similarly, Paradigm Plus from Houston-based Protosoft supports the Lekkos methodology. We will see this area continue to evolve, especially as some of the more traditional CASE companies like KnowledgeWare shift into this part of the market. James Martin is known to be working on business-oriented approaches to object-oriented development.

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CASE TOOLS SUPPORTING OOAD

Tools that support OOAD are part of the larger set of tools referred to as "upper CASE" tools. All upper CASE tools provide support for diagramming in one or more methodologies. This means they allow an analyst or designer to draw the diagrams and enter the descriptions according to the definition of the method.

This is not enough, so beware of these tools. The tools must also implement the various rules and evaluation criteria to perform design checking and insure the method is being properly followed. Further, the tool should allow the designer to naturally follow the step-by-step process of the method. Most of these tools have some sort of repository associated with them. Only a few were developed specifically to be optimized for OOAD. Their repositories are structured with the idea of storing the object-oriented design in a canonical form appropriate to the paradigm.

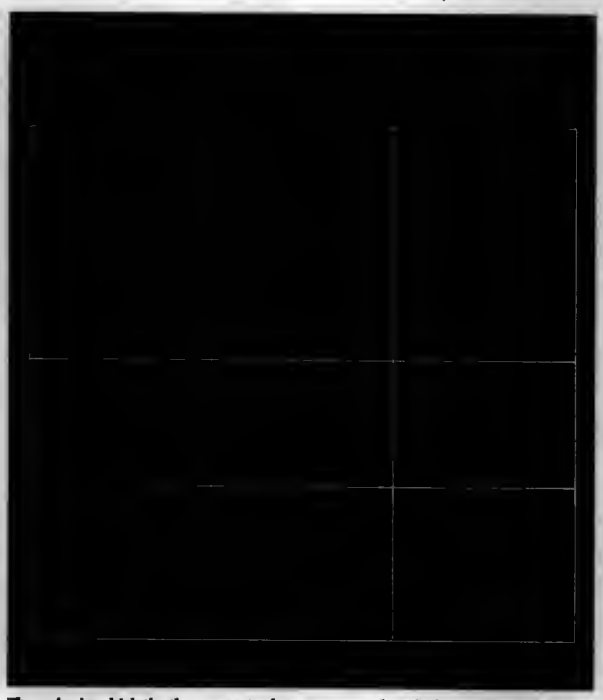
When this is the case, the tool can often support more than one OOAD method, storing the essence and details of the design in its repository and displaying it more than one way. A tool with this capability generally lends itself to customization. Another important aspect of the tools is whether (and how) another tool vendor can interface its tool, e.g., a project management package, to the repository.

THE MARKET FOR OOAD TOOLS

The market for OOAD tools is small when compared with the overall market for CASE tools. IDC believes that the OOAD tool market will remain relatively small, but will grow at a faster rate until 1996 when it will assume a growth rate similar to the overall CASE market.

Unix workstations are and will be the dominant platform in this market. While Ada has played a role in this market, it is diminishing quickly as C++ takes over. Both tool and training vendors report that C++ is the language of choice for more than 90% of their clients.

Several of the tool vendors are seeking alliances with either workstation vendors or very large consulting companies. This is a common strategy designed to circumvent the problems that small companies often have when they try to support client bases that are scattered over wide geographical areas. One Swedish vendor, Objective Systems, can be expected to enter the U.S. market in 1992 using this strategy.



The order in which the three aspects, data, process and control, are addressed during the analysis and design of a complex software system is a major distinguishing characteristic of different types of methodologies.

OOP LANGUAGES

There are more than 80 object-oriented languages. Of these, less than a quarter are commercial products; the rest are research vehicles or associated with university projects. All 80 are based on one of four categories: Smalltalk, Pascal, C or Lisp.

Since the 1970s, object-oriented capabilities have been added to Lisp, Pascal, and C. Flavors, LOOPS and CLOS (Common Lisp Object System), have object-oriented enhancements for Lisp. CLOS is being proposed as an ANSI standard. Smalltalk has the reputation of being the purest object-oriented language and contains many concepts derived from earlier work performed in the development of languages like Simula. C++ is an extension of C, and is referred to as a hybrid object-oriented language. There are similar extensions of Lisp and COBOL in the planning stages.

C++, developed at Bell Labs and marketed by AT&T in Morristown, N.J., is rapidly emerging as a de facto standard for object-oriented C. Its nearest competitor is Stepstone, Corp., Sandy Hook, Conn., with its Objective C. The NeXT computer includes Objective C in its programming environment, and IBM has purchased rights to market it.

Digital Equipment Corp. has its own object-oriented language, Trellis. Two

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languages with minor market shares are Actor from the Whitewater Group, Evanston, Ill., and Eiffel from Interactive Software Engineering, Goleta, Calif. Each is unique and proprietary. Ada is sometimes considered an object-oriented language because its packages resemble objects. However, Ada does not support inheritance or dynamic binding.

C++ VS. SMALLTALK

Two languages appear to be the emerging winners in the marketplace. These are Smalltalk and C++. Some companies like Digitalk (Smalltalk V) and Interactive Development Environments (C++), support just one object-oriented language. Others like Parc Place support both.

An IDC user survey reenforces this view. C++ and Smalltalk are the two dominant object-oriented languages at Fortune 500 sites and with vendors who develop software products. The same IDC survey shows that COBOL continues to dominate the programming activities of programmers in commercial operations. Its use far exceeds any other language, 4GL or CASE product. The relevant question here is, among those interested in object-oriented programming, why is C++ preferred over Smalltalk?

Based on its research, IDC believes the strong support for C++ is concentrated in the community of programmers who develop software products, are involved with more complex, technical applications, are in the advanced technology groups of the Fortune 500, or develop tools and utilities for the internal use of commercial information processing operations. It is these groups that constitute the C user community, and it is the C user community that is generating most of the demand for C++.

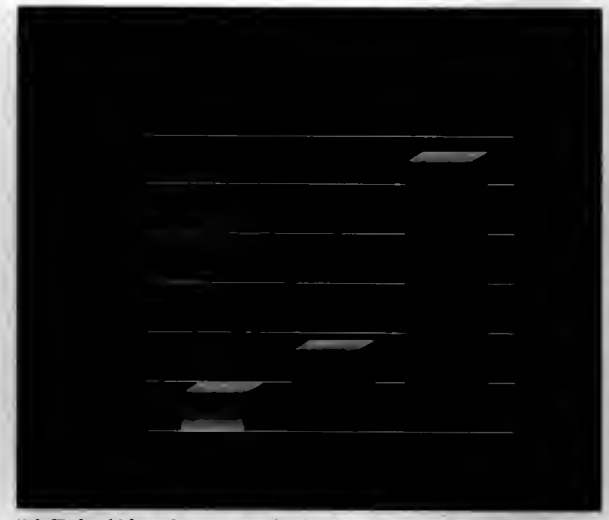
These programmers regard C++ as a better C, or in some cases, just as the next revision of C. Having already embraced C, they are far more likely to adopt the hybrid C++ language than to convert to a significantly different language like Smalltalk. The C++ extensions to C are relatively small. That is, well over 90% of C++ is C. With these extensions, C++ becomes an enhanced C. Stronger type checking is the most common enhancement.

IDC believes that it is still unclear which object-oriented language will be the dominant choice of the average MIS professional, who today finds C very unfriendly. Will Smalltalk enjoy some success in this group, or will an object-oriented extension to Cobol prolong its popularity? It is too early to tell. It is certainly not too early to tell that other important trends, such as increases in client/server applications, will affect the outcome.

One thing that can clarify this is the object-oriented application development environment. These products attempt to provide a level of isolation between the developer and the underlying programming environment. One example is Intellicorp's ProKappa product, which provides an environment and libraries for object-oriented programming in traditional C and C++. A more specialized example is Gain Technology's object-oriented framework that supports visual authoring for developing hypermedia applications. A somewhat different example is Borland's attempt with ObjectVision to reduce the effort encountered when trying to program database applications for Windows 3.0 by shielding programmers from some of the nitty-gritty details that can make their tasks more complicated.

As application development environments evolve, especially to the extent that they provide higher degrees of "visual programming" support, some aspects of application development will become more dispersed from the centralized MIS organization and into the functional line organizations. The object paradigm will facilitate this shift. The MIS organization will have a core of object-oriented (probably C++) programmers who will both acquire, create and manage the libraries of objects, methods and other reusable components that will be relevant to the enterprise. The systems analysts in the line functions will assemble these, using the visual programming user interfaces of the application development environment to create the applications needed to run the business.

Business modeling and business process modeling will play a role. CASE tools and analysis and design methods can be expected to evolve toward supporting various aspects of business process redesign.



NobelTech, which produces command and control systems for the Swedish defense services, projects its object-oriented programming approach to developing software systems for Swedish navy ships will increase productivity 600% over previous methodologies.

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OBJECT DATABASE MANAGEMENT SYSTEMS

To be useful for real-world applications, objects must continue to exist after the program run has been completed. This is referred to as persistence. In some applications this is done with proprietary file systems. More recently, object-oriented database management systems have become a viable alternative. ODBMSs are needed to provide permanent storage for objects. Their data model has objects with the same characteristics as objects in object-oriented programming. Only here the objects are persistent.

ODBMSs are also needed for other reasons, including handling complex data structures and abstract data types, and to support long duration transactions. ODBMS vendors must, therefore, provide both the capabilities of traditional DBMSs, e.g., back-up and recovery, transaction management, security and performance, but also support object orientation, e.g., object identity, encapsulation, types or classes, and inheritance.

IDC estimates that the market for ODBMSs was $13.7 million in 1991. This market will grow to $446 million by 1996. Applications in the manufacturing industry account for the largest industry segment. Workstations are and will continue to be the platform of choice by a very wide margin.

These projected sales increases are in part attributable to the marriage of object-oriented analysis and design tools with computer-aided software engineering packages.

VENDORS AND PRODUCTS

The market for ODBMSs is emerging rapidly. ODBMS vendors are developing application development tools, porting to new hardware platforms, building interfaces to existing software environments, and enhancing database performance and utilities.

Vendors with existing or announced ODBMSs include Innovative Systems Techniques, Itasca, Persistent Data Systems, O2, Objectivity, Object Databases, Object Design, Ontos, Servio Logic Corporation, Symbolics, and Versant, as well as such major hardware vendors as Hewlett-Packard.

ODBMSs and relational DBMSs can each be enhanced with the other technology. The relational model is suited for traditional data; the object-oriented model is suitable for text and other data types. At least one vendor, UniSQL, of Austin, Texas, offers a product that combines support for both object and relational data models. Since traditional data is only a minority of the information in organizations, there is a very large market potential for ODBMSs.

In order to realize these increased sales, object-oriented database management system vendors must provide the capabilities of traditional database management systems along with those of their object-oriented counterparts: object identity, encapsulation, types or classes, and inheritance.

APPLICATION INTEROPERABILITY FRAMEWORKS

Object-oriented concepts can be applied at many different levels. At one end of the spectrum is the idea that whole programs, even whole applications, can be treated like objects. By this we mean they can be treated as a form of encapsulation in which a set of operations is defined for the program. The program then becomes a server object, which will respond to a message requesting the performance of one of its operations. At other times it

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may be a client object, sending a message to another object. This approach allows a gentle transition of existing, non-object-oriented, programs into an object-oriented environment. This is particularly powerful if the environment is distributed across a collection of heterogeneous platforms.

There is no standard name for this type of environment yet, so IDC calls it an object-oriented application interoperability framework. Another term used by some is distributed object management system. The central service is called the Object Request Broker (ORB). The ORB is at the core of this architecture. An application object, or client, sends a message to another application object, or server, requesting some action, e.g., a service of some kind. The ORB fields the request and performs three functions transparently:

- finds the object that will perform the service
- conveys the request to the object and coordinates the receipt of any response
- selects and binds a method to the serving object that performs the requested operation.

The Object Management Group, discussed below, has been a catalyst in standardizing ORB architectures, particularly as they relate to the interfaces in such an environment. This standards activity is becoming a catalyst in the industry, accelerating product development activities at major firms. The result will be a flurry of product announcements in 1992. Among those known to be active in this area are NCR — this is an important element of its "Cooperation" environment — Sun, HP, Digital Equipment and a newcomer, Hyperdesk.

An example is Digital Equipment's ACA Services. The ACA Services are Network Application Support (NAS) software products that provide facilities for integrating independently developed applications and services across a networked, mixed-platform computing environment.

Savings of up to 20% over traditional integration techniques may be realized using DEC's ACA Services.

ACA Services can be used in many application domains, such as CASE, CIM, systems integration, electronic publishing and office automation. Andersen Consulting recently conducted a study that found that it is reasonable for systems integrators to expect potential savings of approximately 20% over traditional integration techniques using ACA Services for new system development. Savings of at least 50% can be expected in reengineering systems.

OBJECT MANAGEMENT GROUP

OMG was formed in 1989 by a small group of vendors and user organizations to create a standard that would support portability of, and interoperability between, independently developed applications across heterogeneous networks of computers. OMG membership has steadily grown and now exceeds 200 organizations, mostly vendors. OMG's staff numbers fewer than 10. The vast majority of OMG's work is carried out by employees of its member companies. The participating companies are investing heavily not only in membership fees but in time and effort as well. This in itself is a clear indication of the importance that these leading vendors are placing on object technology.

GETTING STARTED

When making the transition to object technology, it is wise to do so in a deliberate, evolutionary fashion and awareness that there is a steep learning curve. There are several initial steps to make.

- Secure a financial commitment from top management. Top management should realize that savings will occur in subsequent projects.
- In order to gain acceptance, pick a new project, not a partially completed one. If applications are being downsized or moved to a client/server environment, developers will be more open to object technology.
- Use external training and consulting organizations for the transition to object technology.
- Address the shift in skills mix that must accompany the corresponding shift of activities toward the front end of the software development life cycle.
- Pay attention to administrative issues, i.e. managing class libraries. Consultants can help here.
- Encourage systems analysts to use object-oriented analysis and design methods that concentrate on modeling their businesses.
- Reward programmers for creating and using reusable code.

CONCLUSION

Object technology is still evolving, but it is mature enough to put into production. Its impact has been broadly felt in the industry. There is a rich array of products and services now available. The benefits have been conclusively established. They are substantial, but they do require the investment to make the paradigm shift. It is a shift worth making.

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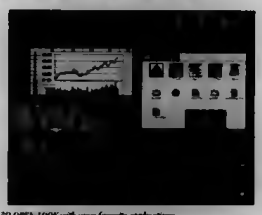

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IN BRIEF

Visual, Link partner up

■ A product development partnership between X Window System display vendor **Visual** in Westboro, Mass., and Fremont, Calif.-based general-purpose terminal vendor **Link Technologies, Inc.** is slated to spawn a four-model line of low-cost X terminals this summer. The products will be marketed to resellers whose customers are moving to Unix and client/server applications, according to the firms.

■ Interconnect vendor **McData Corp.** in Broomfield, Colo., said its LinkMaster 7100 Network Controllers have been certified for the General Services Administration's price list and have been deemed compliant with the Government Open Systems Interconnect Profile (GOSIP). GOSIP is the federal government's mandate for supporting Open Systems Interconnect protocols. The 7100 is an alternative to IBM's 3174 cluster controller.

■ Fort Lauderdale, Fla.-based **Telematics International, Inc.** said last month that it guarantees networkwide delivery of frame-relay packets to users of its Net25 frame-relay and X.25 switches, regardless of the quality of the communications circuits. The company chalks up the ability to make the claim to its data switch delivery protocol, which adds Open Systems Interconnect data link-layer protocols to frames entering the backbone.

Nestle to blend E-mail

CONTINUED FROM PAGE 51

Canada. Nestle is moving to centralize its manufacturing and warehousing sites to serve these regions in a more unified way, realize economies of scale and serve transnational customers more effectively.

However, a prerequisite for making the whole thing work is an efficient, cost-effective network for transferring requirements, shipping information and inventory data among Nestle's worldwide manufacturing, warehousing and sales sites, Dispaux said.

"We need telecommunications to keep track of who needs what when. The alternative — to do it by phone and facsimile — is inefficient," he said.

Cost benefits

Indeed, Nestle hopes that the E-mail network will reduce fax and telex costs by 30%. This savings will be realized once the network is up, Dispaux said. The company expects to have 65% of its business connected on Infonet's service by year's end.

However, "the biggest benefit I see of the network is not so much money, but the ability for people to communicate with one another and make decisions faster," Dispaux said. One goal of the network is to increase the total number of E-mail boxes throughout Nestle from the current 6,000 to 60,000, he added. Nestle has approximately 200,000 employees worldwide.

Behind this move is a recent decree from the Nestle chairman's office that the company begin fostering freer communications among employees that do not depend on going up and down the management hierarchy, Dispaux said. "We are not doing away with the hierarchy" as a structure for decision-making, he said. "We are just opening up communications."

Having determined that a private, leased-line network would be too costly, the company decided to go with a value-added network service. It wanted a carrier that would take over the burden of implementing and managing the network but one that would be open enough to allow Nestle to exit to another vendor — or to a private system — should the need arise, Dispaux said.

Nestle chose Infonet from an initial field of 12 vendors. A major factor in the decision was the carrier's use of a commercial software package — Soft-Switch, Inc.'s Central — as the basis for translating incompatible E-mail messages, Dispaux said.

> NESTLE EXPECTS to have 65% of its business connected on Infonet's service by year's end.

Nestle uses a wide range of E-mail systems, including Verimation, Inc.'s Memo, IBM's Professional Office System and OfficeVision, Microsoft Corp.'a Microsoft Mail, Lotus Development Corp.'s CC:Mail and Infonet'a own Orion.

In addition, Infonet has a presence in the majority of countries where Nestle has sites it wants to interconnect, Dispaux said. A third, minor advantage was the fact that the Swiss Postal Telephone and Telegraph authority (PTT), Nestle's primary network provider in Switzerland, owns shares in Infonet — as do a number of other European PTTs. Other companies that made Nestle's short list included Digital Equipment Corp., IBM Information Network and BT.

Nestle'a contract with Infonet is a 90-day service agreement. The amount of the contract was not disclosed.

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Wireless LANs, WANs draw new attention

BY ELLIS BOOKER
CW STAFF

DES MOINES, Iowa — Wanting to add several small, nearby branches to a local-area network at its headquarters but also trying to avoid cabling costs, Hawkeye Bank & Trust of Des Moines recently installed WaveLAN, NCR Corp.'s radio frequency-based LAN.

The bank also picked a wireless solution for its wide-area network. Instead of installing expensive T1 lines between the remote branches and headquarters, it put directional antennas atop each building to extend each building's WaveLAN back to the bank's headquarters. At its farthest point, this wireless, 2M bit/sec. WAN stretches 15 miles.

Any future expansion in Hawkeye's office or headquarters' LAN "is going to be wireless — absolutely," bank operations manager Nancy Anstoetter said.

Notwithstanding Hawkeye Bank's enthusiasm, industry analysts pointed out that wireless LAN technology has not taken off so far. "The wireless LAN is a niche market right now," said Charles Pettirossi, a LAN analyst at International Data Corp. in Framingham, Mass.

Wireless LAN vendors, he added, have encountered resistance among users unwilling to abandon sizable investments in wire-based networks and unwilling to pay the average 35% to 50% premium of these networks over conventional ones. Nevertheless, Pettirossi predicted growth in the number of wireless LAN nodes sold, from the fewer than 24,000 sold last year to 580,000 in 1996.

Needed boost

Fueling this growth will be the addition of wireless capabilities to laptop, palmtop and other portable computers and devices, many analysts said.

Two weeks ago, GEC Plessey Semiconductors in Scotts Valley, Calif., announced a 2.4-GHz wireless transceiver for this emerging LAN market. Already in the hands of some of GEC's key customers, the credit card-size module is capable of 1M bit/sec. data rates and is expected to be in full production early next year.

Estimates for the wireless local- and wide-area data networking market by the end of the decade range considerably, from $3.5 billion to $13 billion. Given this opportunity, the last several months have seen a rash of partnerships among leading computer vendors, wireless data network carriers and cellular phone companies.

Last month, nine leading cellular companies and IBM announced plans for a summer trial of an IBM technology for delivering packet data over analog cellular telephone networks.

This week at the International Communications Association show in Atlanta, Digital Equipment Corp., Ram Mobile Data, Inc. and Ram's major shareholder, BellSouth Corp., are expected to delineate DEC's wireless WAN strategy.

On the air

Once characterized by proprietary protocols, RF-based LANs have begun to adopt standard networking approaches.

Last week, Windata, Inc. announced the first wireless LAN to use the Ethernet (IEEE 802.3) standard and a Simple Network Management Protocol platform. The firm's FreePort Wireless LAN offers throughput of up to 5.7M bit/sec. The system can transmit up to 260 feet and penetrate up to a dozen interior office walls, Windata said. The network can accommodate up to 256 users on as many as 62 wireless transceivers.

Available in July, Windata's FreePort has two wireless Ethernet hub options: a 32-transceiver system for $4,695 and a 62-transceiver system for $5,895. To access the wireless Ethernet, each client workstation requires Windata's $997 wireless transceiver.

ELLIS BOOKER

Ryland goes live with backbone

CONTINUED FROM PAGE 51

Ryland's intrabuilding network represents a consolidation of a previous five-building campus configuration also linked with fiber. The Wellfleet router serves as a "backbone in a box" on the first floor, taking in all local Novell, Inc. IPX and TCP/IP traffic and bridging or routing it up to the floors. The HP, Wang and 3270 traffic bypasses the wiring hub and router, traveling directly to the Magnum 100 TDM. Wide-area HP, Wang and IBM traffic travels directly from the multiplexer to an AT&T/Paradyne wide-area switch and out over 56K bit/sec. leased lines to the divisions.

Those leased lines could be replaced next year when Ryland installs LANs at its 50 branch sites and seeks schemes for cost-effectively internetworking them back to corporate headquarters, Setzer said. "Frame relay might be best, if we don't have to pay for a line to sit there," he said. "The ultimate would be to dial up 256K bit/sec. if I need it through the regular telephone system."

Also next year, Setzer said he sees where an agreement announced last month between Fibermux and Wellfleet to put router modules in Fibermux Crossbow hubs could provide his remote LAN sites with low-cost routing solutions.

"This would be helpful to allow people in one division to log into another division's network and help them with their work load — along the lines of 'the LAN becomes the WAN' philosophy," he said.

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NEW PRODUCTS

Network management

Systran Corp. has introduced a network monitoring system for the ScramNet network.

The ScramNet network monitoring system contains a monitor board, monitor software and either a Hewlett-Packard Co. 16500A/16510B color logic analyzer or an HP 1650B monochrome analyzer.

The system provides monitoring of software operations, plus data flow and data content at the monitor board's host node.

The product also features fiber-optic technology, interrupt structure, data filtering and a programmable byte swapper.

The ScramNet network monitoring system for VME-based systems costs $17,500 for the color system, $13,700 for the monochrome system and $4,900 for the network monitor node only.

Systran
4126 Linden Ave.
Dayton, Ohio 45432
(513) 252-5601

Applitek Corp. has announced the LANcity Access Module.

The LANcity Access Module allows users to monitor an entire LANcity metropolitan-area network (MAN) via Digital Equipment Corp.'s DECmcc Management Station.

The product also monitors data traffic on the Ethernet and broadband segments of the MAN, the company said.

LANcity Access Module costs $999.

Applitek
100 Brickstone Sq.
Andover, Mass. 01810
(508) 475-4050

General Software, Inc. has announced LANprobe, a software-based network analysis tool.

LANprobe captures and analyzes data traffic including security-related data. It is transparent to network users and can display packets in high-level form, hexadecimal form or decoded and annotated format.

LANprobe works on a personal computer. The price is $995, including an Ethernet host adapter for connection with the network.

General Software
Suite A3
15600 N.E. 8th St.
Bellevue, Wash. 98008
(206) 391-4285

Gateways, bridges, routers

Shiva Corp. has announced LanRover/L, a dial-up server for Apple Computer, Inc. PowerBook portable systems.

LanRover/L connects directly to the network. Remote PowerBook users and Macintosh users can dial in and connect to the network server. LanRover/L also provides centralized management features and security options.

The product is priced at $699.

Shiva
One Cambridge Center
Cambridge, Mass. 02142
(617) 252-6300

Armatek, Inc. has announced EasySpan, a product for connecting personal computer networks across distances of up to one mile.

EasySpan is based on time division multiple-access radio technology and handles data transfer at rates up to 2.5M bit/sec. It is compatible with Ethernet, Token Ring and Arcnet local-area networks running a number of different network operating systems.

EasySpan pricing is based on the number of LANs to be interconnected. Two LANs can be connected for less than $5,000.

Armatek
Building 125
601 N. Glenville Drive
Richardson, Texas 75081
(214) 437-5833

Micro-to-host

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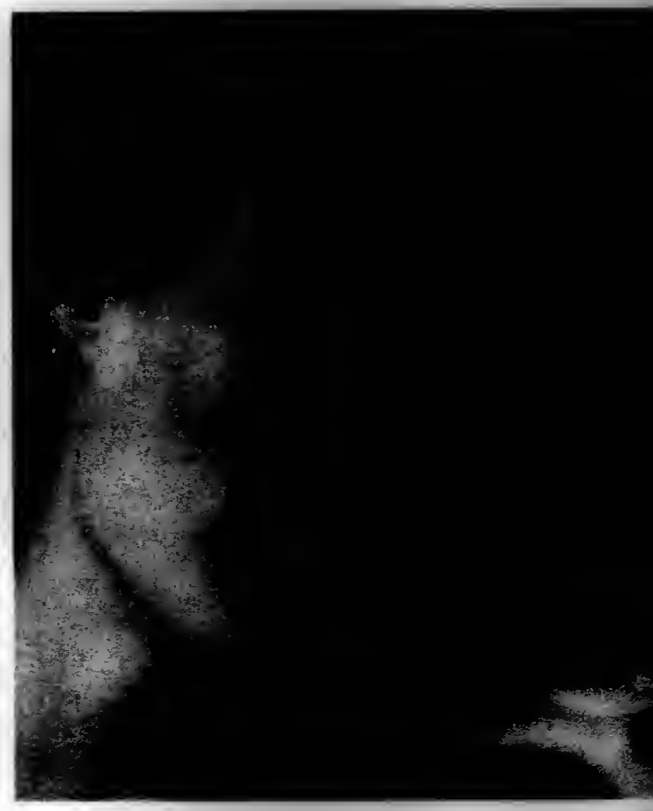

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BY JEAN S. BOZMAN
CW STAFF

WALNUT CREEK, Calif. — Kaiser Permanente of Northern California is a collection of many parts: It is a chain of 30-plus hospitals and medical clinics, a 2.5 million-member health maintenance organization and an insurance company. Kaiser's business units have been successful, but diversification has caused data to be spread throughout diverse systems in the different businesses.

Following two years of 15% growth, Kaiser's booming business slowed during the current recession. That slowdown, according to Philip Newbold, vice president of information services, has created a good time to put a unified computer architecture in place, linking systems from IBM, Tandem Computers, Inc. and Digital Equipment Corp.

Newbold, who came here from San Francisco's BankAmerica Corp. one year ago, said he expects a unified architecture to reduce redundant data processing and increase end-user productivity.

"Historically, we were breaking the customer [record] into multiple pieces," Newbold said. "The challenge is to merge this data from all the computer systems and to do it at the time when we have an interaction with the patient."

Beyond presenting a unified medical history, the customer profiles will contain billing information and laboratory test results. That will eliminate duplicate data searches in the IBM and Tandem aystems.

All in one place

New applications will present a single system view to physicians, accountants and business managers. "This organization will end up being the enterprise repository for clinical information and business information," Newbold said.

The benefits of linking the IBM and Tandem systems have already started. When data is transparently accessible — several years hence — doctors will be able to track the cost-effectiveness of medical treatments. Such analyses will determine which treatments Kaiser should be offering.

The groundwork for the integrated data architecture began in 1988, when Kaiser acquired Texas Instruments, Inc.'a Information Engineering Facility (IEF) computer-aided software engineering (CASE) tools. Data modeling and some programming began in 1989, with the aim of building data repositories that can be shared by many applications.

Kaiser is using IEF to generate code for the IBM mainframes, and IEF code generators for Tandem systems are being beta-tested here.

Business requirements are modeled and then specific systems developed with IEF's lower CASE tools. "We are moving the skill set of programmers up one notch, in terms of abstraction," explained Joseph Yanov, Kaiser's manager of development technology. "We're moving from systems analysis to business analysis and taking a fundamental look at what the business activity and the data needs are, then looking at the systems requirements in context of those needs."

Developers are working in teams to combine the technical and medical skills needed to create integrated health care systems. Teams of physicians, nurses and information systems staff members meet regularly to model business-based information requirements. "Historically, we didn't do very well in the area of teamwork," Newbold said. "It was a very fractionalized way of doing IS."

The result of this re-engineering project will be a single, logical view of the centralized databases, whether accessed by a terminal or by a personal computer. "We need to have a sin-

Continued on page 88

ON SITE

Kaiser Permanente of Northern California
Walnut Creek, Calif.

Philip Newbold

- **Challenge:** To provide users with a common view of data drawn from different business units.
- **Strategy:** To maintain legacy IBM systems while moving to client/server applications and relational database technology, including IBM's DB2 and Tandem's NonStop SQL.
- **Expected results:** Reduced redundant processing and better analysis of the cost-effectiveness of medical treatments.

CW Chart: Guy Stuart

AI makes mark in corporate world

BY GARY H. ANTHES
CW STAFF

MENLO PARK, Calif. — Systems that boosted customer support effectiveness at Compaq Computer Corp. by 74%, reduced market analysis time at A. C. Nielson Co. from weeks to hours and saved others millions of dollars in operating costs recently won awards from the American Association for Artificial Intelligence (AAAI).

The 19 awards, given annually for innovative applications of AI, will be presented in July to transportation, banking, consumer goods, manufacturing, petroleum, health care, travel, utility and software companies and government agencies, many of which "have not previously been at the cutting edge of advanced technologies," according to the AAAI.

To be chosen for an award, an application must be deployed and producing measurable benefits, the AAAI said.

One of Compaq's corporate objectives sounds a bit like a scout pledge: "The mission of

Continued on page 92

The winners are . . .

The AAAI picked 19 winning AI applications, including the following:

- **American Express Co.** — for its knowledge-based system to help review accounts for credit risks and potential fraud. Estimated savings: at least $1.4 million per year.
- **Whirlpool Corp.** — for its AI assistant to customer service representatives that helps troubleshoot problems coming in by telephone. Estimated savings: $4 million to $6 million annually.
- **Xerox Corp.** — for an AI system that estimates costs in piece-part manufacturing. Estimated savings: $20 million annually.
- **A. C. Nielson** — for a knowledge-based system for filtering and distilling gigabytes of data from packaged goods sales scanners. Reduces analysis time from weeks to minutes.
- **Bell Communications Research, Inc.** — for Intelligent Code Inspection in C language environment, which uses expert knowledge to find bugs. Estimated annual savings in software inspection costs: $1.7 million.
- **United HealthCare Corp.** — for its Claim Adjudication Review Expert system, which applies medical knowledge to evaluate health care claims. Goal: to reduce the number of claims needing manual review by 30% to 40%.

3270 Coax for UNIX

CLEO

Erasable optical discs enter new era

Study predicts that prices for erasable optical disc drives will decrease as much as 25%

BY JEAN S. BOZMAN
CW STAFF

SANTA CLARA, Calif. — Three years after their commercial debut, erasable optical disc drives are being priced for commercial information systems applications.

A study by Computer Intelligence/Infocorp in La Jolla, Calif., forecasts that prices of 3½-in. drives will drop between 20% to 25% this year, making entry-level prices dip below $1,700. Prices for 5¼-in. drives, which range from $12,000 to $25,000, should also drop, CI/Infocorp said.

The erasable discs retain data on plastic platters that look like those used in a compact disc player but can be erased once the magneto-optical media is heated to 150 degrees Celsius by the drive's onboard laser. Generally, these discs are housed in a plastic cartridge for handling. Jukebox hardware is used to store multiple erasable disc drives side by side.

Capacity for the erasable discs is 650M bytes for a 5¼-in. drive and 128M bytes for a 3½-in. drive. As with floppy disks, erasable discs can be "flagged" to prevent the drive from erasing critical data, said Kathryn Hilton, program director of storage research at CI/Infocorp.

CI/Infocorp predicts that sales of write-once, read many drives will slow as "multifunctional" disc drives incorporate both erasable and nonerasable technology. Hewlett-Packard Co.'s Greeley, Colo., storage plant will soon ship a 5¼-in. multifunctional erasable drive based on Sony Corp. technology, Hilton said. Users can place erasable and nonerasable media in the same drive.

Until now, large systems vendors such as IBM, Wang Laboratories, Inc. and Unisys Corp. have included erasable discs in imaging solutions — often with 12-in. erasable discs. But as prices fall, third-party personal computer suppliers will use magneto-optical technology, Hilton said.

In many cases, according to Hilton, the 5¼ and 3½-in. erasable drives will substitute for existing floppy disk drives.

The leading suppliers of erasable drives worldwide include Sony, Panasonic Corp., IBM, Ricoh Corp. and Maxoptix Corp. in San Jose, Calif., a joint venture between Maxtor Corp. and tractor giant Kubota Ltd.

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Kaiser unifies diverse systems

CONTINUED FROM PAGE 87

gle-system image," said Valerie Yeaton, project manager for data and application architecture. "We need to have one computing environment, one log on, one look and feel and one security system."

Using 13,000 terminals, Kaiser users now log on to central systems; they toggle back and forth between the IBM and Tandem systems, using a hot key on their keyboard. A new generation of PCs, now being prototyped for client/server applications, will have the intelligence to make specific database queries. They will be tested in Kaiser hospitals this year.

> "HISTORICALLY, WE WERE breaking the customer [record] into multiple pieces. The challenge is to merge this data from all the computer systems and to do it at the time when we have an interaction with the patient."
>
> PHILIP NEWBOLD
> KAISER PERMANENTE

Kaiser's warehouse of data is housed in IBM-compatible mainframes and fault-tolerant Tandem computers. A new Hitachi Data Systems Corp. EX 420 supports on-line medical systems, an IBM Enterprise System/9000 Model 720 supports finance and administration, and the IBM 3090 Model 600J supports development and testing.

Eighteen Tandem Cyclone processors and eight older Tandem VLX processors handle medical records for the hospitals and clinics. Four DEC VAX systems support medical laboratories and handle office automation for Kaiser's sales and marketing staffs.

The central relational databases — the IBM DB2 and Tandem NonStop SQL — are now linked through a software gateway so that updates on one system can be automatically posted on the other. However, only some applications require instant updates; others are updated on a scheduled basis.

Until now, network printers have had the same fifteen-foot restriction.

With HP network-ready LaserJets, you can put your printers where your users are.

Now you can forget about tethering your printers to some faraway server. Because network-ready LaserJet printers can be placed anywhere along your network. Just plug them in as you would PCs and you're ready to roll.

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COMMENTARY

Efrem G. Mallach

'The Year of Disk Choices'

Headlines have proclaimed that 1992 is "The Year of Disk Arrays." That's not the worst of it. The really frightening news, if you have an IBM or compatible mainframe, is that 1992 is "The Year of Disk Choices."

Time was, the DASD decision was simple. The latest IBM technology defined the state of the art and was the ideal choice. Any compromises were just that: compromises.

Those days are gone, perhaps forever. IS managers who just order IBM's latest and largest will soon find themselves tossed out on their collective ears. We are in a period of mass storage discontinuity, where "buyer beware" takes on intense reality. System planners must — not should, must — now consider at least five meaningful alternatives:

• **RAID.** PC mass storage costs less than $4 per megabyte. How does that compare with a 3390? If you could only make a bunch of PC disks look like a 3390, you could make the comparison. Storage Tek has done just that with its 9200 Iceberg system. Of course, the chance of a failure in 16 small drives is a lot higher than the chances of a 3390 failure, but the small ones are so cheap that the system can build in extra drives for error correction. The net effect: A better mean time between failure rate than one big disk. (There may be less to this than meets the eye, as the extra RAID electronics have a failure potential of their own.) RAIDs are also fast.

Despite some lingering concerns over low-level compatibility issues and "true" capacity in terms of real-world data compression, Storage Tek's entire production is sold out for a year. There's no magic here. Storage Tek doesn't have a patent on the RAID idea (you can get RAIDs for micros and minis, too). If Iceberg works in customer shops, other mainframe offerings won't be far behind.

• **Database processors.** A great idea: Send it a logical-level database request and run another job until the answer comes back. Trouble was, database processors used to come from garage shops with odd-sounding names such as Teradata. What's new this year? NCR, and hence AT&T, own Teradata now. That ought to make you more comfortable trusting your precious information to them.

If you're pushing the performance limits of your system, send a lot of CPU cycles accessing databases and don't mind changing some access methods, these are worth a look.

• **Plug-compatible manufacturers (PCM).** It used to be that one went the PCM route to save 20% on copycat products. One then suffered through many anxious moments wondering if it was absolutely, positively compatible, or if the service rep would ever show up. If that's your image of today's PCMs, wake up and smell the coffee. Compatibility is now a given.

Today's test is how far the plug-compatible products surpass the originals. Hitachi Data Systems 3980-compatible 7980 controller can get 50% more throughput from a given DASD farm than can a "real" 3980. It accomplishes this invisibly via more effective cache management algorithms, a faster controller microprocessor and more efficient controller microcode.

Ergo, you can cover more of the disk surface with active files, a vital consideration with today's multigigabyte drive capacities. Ergo, you save big money. If you want a nice performance boost with no change to the way your mass storage works, call them. You might even save a few bucks.

• **Solid-state storage.** Do access times measured in microseconds, instead of milliseconds, sound good? Today's semiconductor storage prices make solid-state "disks" a viable alternative to rotating disks for high-performance applications.

Solid-state storage costs more than you'd pay for the rotating magnetic variety, but it's cheaper than a central storage upgrade. Suppliers, besides the aforementioned HDS and Storage Tek (I'm not on their payroll, but facts are facts), include Intel and Amdahl.

• **Optical discs.** The writable sort have gone from laboratory curiosity to real-world usefulness in a short time. You wouldn't want to put the index of your most active VSAM file on one, but they have a unique place in the cost/capacity/performance spectrum that could help you optimize your system with no application software changes.

This boils down to one distressing fact: Today's DASD planner has to think. The options can no longer simply be rated as seven or nine on the same yardstick. They are on different yardsticks. Comparing them requires more effort than comparing two large rotating magnetic drives with conventional controllers. Unfortunately, that effort is required in 1992. Maybe next year things will be simple again. But don't count on it.

Mallach is a faculty member at the University of Massachusetts at Lowell in Lowell, Mass., and a consultant to users and vendors.

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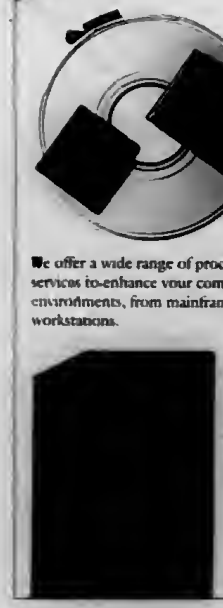

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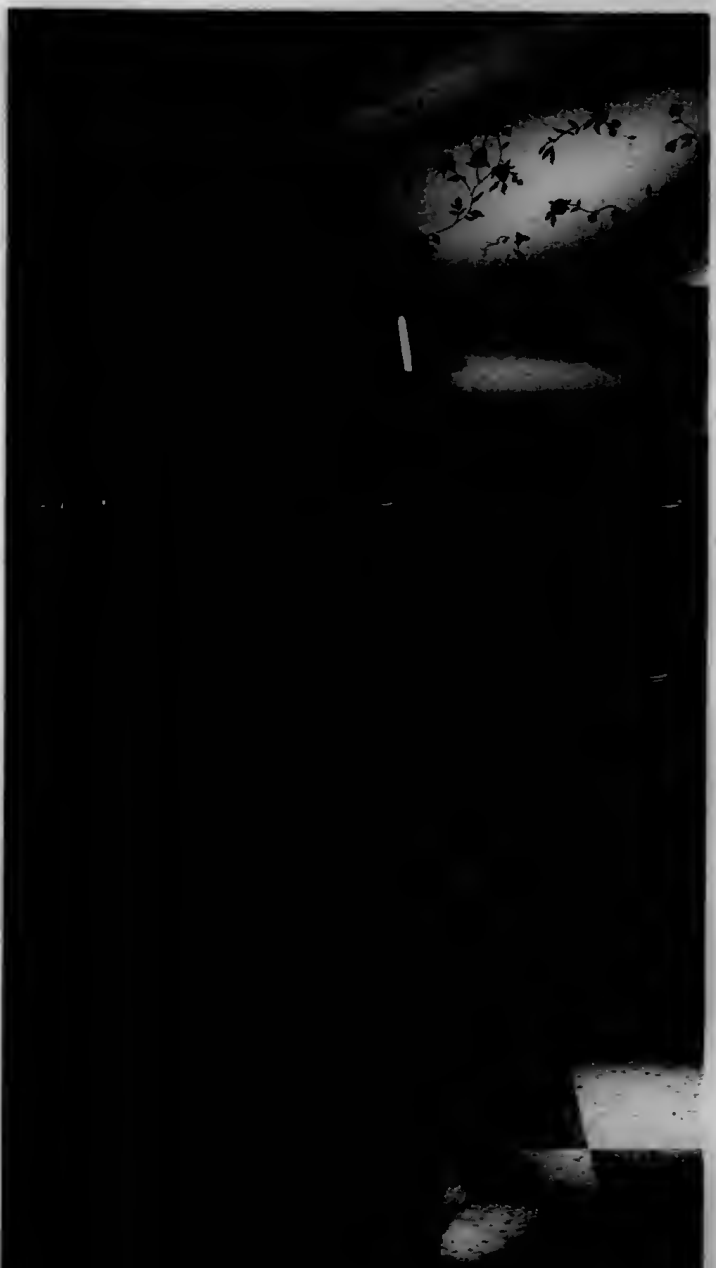

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Wang unveils high-end VS series upgrade

BY KIM S. NASH
CW STAFF

LOWELL, Mass. — After several months of prepromotion to spark interest and convince users that it stands behind its proprietary minicomputer line, Wang Laboratories, Inc. recently unveiled a high-end upgrade for the VS series, drawing mixed reviews.

Some users interviewed about the release said they had not been clamoring for the VS 12000, but a few overloaded shops reported the new box, which Wang said runs 50% faster than the former top-level VS 10000, will come in handy.

Kent Electronics Corp., an early adopter of the VS 12000, did see a 50% increase over the VS 10000 Model 100 that it had previously installed, according to Duane Davis, director of MIS at the Houston-based electronics distributor.

"I've watched our system resource monitor every day for four years, and I can see the difference," Davis said. A query that once took up to several seconds now comes back in less than one second, he added.

Showing little interest

Other current users, in what Computer Intelligence estimates as an installed base of about 20,000 sites worldwide, are less interested in Wang's new products. Seeking what they have said is improved price/performance and a way to escape the confines of "closed" systems, firms such as American Family Mutual Insurance Co. in Madison, Wis., and Mutual of New York Financial Services have passed over Wang's new products in favor of Unix boxes during the past year or so [CW, March 9].

One of the problems Wang and some other minicomputer vendors have faced when launching new systems is that they use their own performance measurements — not industry-standard benchmarks, said Thomas Willmott, analyst at Aberdeen Group in Boston. Users and potential customers, therefore, cannot easily compare those machines with others on the market, he said.

Bob Davis, Wang's director of VS marketing, said that internal tests pitting the top-end VS 10000 Model 100 against the VS 12000 Model 550 turned up a performance rating of 15 field-automated sizing tool (FAST) for the new box compared with the previous high-end model's rating of 10 FAST. FAST is Wang's own measure of speed and power of a VS machine running identical work loads of "typical" office applications, Davis explained.

The VS 12000 Model 550 is the first of several VS models due out this year.

Other VS-related products unveiled were an Extended Configuration Support package, which increases the number of peripherals that can be connected to a single controller.

The product is due out by next month and is priced at $11,000 to $31,000; a Fiber Optic Resource Sharing Facility that connects up to four VS processors of any size is also expected by next month, priced at $16,000.

Also introduced were two controllers and two tape drives.

Price differential

Existing Wang VS users can get the new high-end VS 12000 Model 550 for much less than what a new user will pay

	Existing VS user	New user
VS/OS 7.4 operating system license	Free for users of VS/OS 7.3	$130,000
+	+	
Hardware	$429,350 to $601,450	$780,000
+	+	
Extended configuration support package	$11,000 to $31,600	$11,000 to $31,600
Final cost	$440,350 to $633,050	$921,000 to $941,600

Source: Wang Laboratories, Inc.

CW Chart: Michael Siggins

NEW PRODUCTS

Processors

Harris Corp.'s Computer Systems Division has announced the Night Hawk 5000 series of real-time computers based on the Motorola, Inc. 88110 processor.

The reduced instruction set computing-based systems use a real-time version of the Unix operating system. They incorporate from one to eight processors, providing up to 800 million instructions per second.

Harris Corp.
Computer Systems Division
2101 W. Cypress Creek Road
Fort Lauderdale, Fla. 33309
(305) 974-1700

Add-in memory boards for the Digital Equipment Corp. DECsystem 5900 are now available from Clearpoint Research Corp.

The DCME-D52 solution is offered with 8M bytes ($1,030) and 32M bytes ($3,370). The cost includes a lifetime warranty with 24-hour repair or replacement.

Clearpoint Research
35 Parkwood Drive
Hopkinton, Mass. 01748
(508) 435-2000

Data storage

ReflectionManager, a transparent optical jukebox storage management software product, has been announced by Plasmon Data Systems, Inc.

ReflectionManager allows users to upgrade from a single optical disc drive to a jukebox. It integrates with personal computer and local-area network operating systems and supports data transfer rates over a Small Computer Systems Interface channel. Pricing ranges from $2,595 to $6,195.

Plasmon Data Systems
1654 Centre Pointe Drive
Milpitas, Calif. 95035
(408) 956-9400

I/O devices

Coax Direct, a division of Sherwood Digital Electronics Corp., has announced three new coaxial interface cards for IBM printers.

The products connect IBM 4019, 4029 and 4226 printers to a variety of processor types including 3090, 9370 and 3270 controllers. Features include automatic page orientation printing and computer output reduction.

Retail pricing for the CD 4019, CD 4029 and CD 4226 cards is set at $995.

Coax Direct
2252 South 3600 West
Salt Lake City, Utah 84119
(801) 974-0526

Power supplies

Clary Corp. has announced the availability of the Clary Onguard Precision Plus Series of uninterruptible power supplies.

The series works with mid-range systems, local-area networks and personal computers. A 400VA unit, the PC-1240, costs $950; a 1KVA unit, the PC-1K, costs $1,890; and a 1.5KVA model, the PC-1.5K, is priced at $2,590.

Clary
320 W. Clary Ave.
San Gabriel, Calif. 91776
(818) 287-6111

AI makes mark in corporate world

CONTINUED FROM PAGE 87

the telephone support group is to . . . [be] accessible, responsive, enthusiastic, courteous, helpful and caring." Compounding those challenges are an expanding Compaq product line, falling prices and rising demands for customer service.

In response, Compaq and Inference Corp. in Los Angeles developed SMART — Support Management Automated Reasoning Technology — a case-based system for on-line troubleshooting. SMART allows its more than 100 users to match the characteristics of customer trouble calls with those of past cases. For example, a customer reporting "intermittent problems in a Compaq server on an Ethernet network resulting in lockup under high-traffic conditions" would cause SMART to search its database for cases with those characteristics.

Similar cases, with their suggested solutions, would then be displayed on the SMART screen with scores showing just how similar they are. For each matching case, SMART prompts the caller for additional information, such as network operating system. As more information is requested and supplied, the system makes new searches and provides more relevant cases, solutions and questions until the user is satisfied he has the answer.

Compaq said SMART increased the percentage of cases resolved from 50% to 87% and produced labor savings allowing development costs to be recovered in a year.

Compaq said the AI application avoids the knowledge acquisition bottleneck found in many knowledge-based systems because the SMART knowledge base grows automatically as users add cases.

In the spotlight

Market research firm A. C. Nielsen won its award for Spotlight, a knowledge-based system that allows customers to understand what is important in huge databases of point-of-sale scanner information. Nielsen said Spotlight allows analyses to be done in minutes or a few hours that would have taken market analysts weeks to do in the traditional way using intuition and spreadsheet packages.

Northbrook, Ill.-based Nielsen stores have more than 1 terabyte of on-line data about packaged goods — sales volumes by product, store and week; information about price and distribution; and in-store data about displays, discounts, shelf placement and coupons. Spotlight applies "heuristic" techniques — those where precise statistical methods cannot be applied — to find patterns among the data and to find explanations for shifts in market share or sales volume.

Spotlight then applies rules for deciding which tables, graphs and text should present results. In a sample output, Spotlight constructed this printed explanation, which accompanied a bar chart showing coffee market share data: "Blend A gained the most share, up 1.2 points to 7.4. Share change explanation: Price decreased $1.88, or 8.2%, to $21.12."

According to Nielsen, it took 48 man-months over seven elapsed months to develop Spotlight, and the system returned its development costs in six months.

United HealthCare Corp. in Minneapolis replaced its table-driven Cobol system for evaluating medical claims — "saturated with rules and difficult to maintain" — with AdjudiPro, an expert system that emulates the behavior of highly trained medical analysts.

Built around the KES II expert system shell from Template Software, Inc. in Herndon, Va., AdjudiPro automates medical and nonmedical rules. It uses classifications in the medical analyst's "bible," an annual publication called the "Physicians' Current Procedural Terminology."

Developed at a cost of $450,000, AdjudiPro is United HealthCare's first foray into AI. The company expects it to reduce the number of claims needing manual review by 30% to 40% and produce a 47% return on investment over six years.

Summarizing the 19 award winners, the AAAI said the range of organizations and applications using AI — which it broadly defines to include techniques such as expert systems, neural networks, fuzzy logic, machine vision and robotics — continues to grow.

The association also said the development of AI applications increasingly involves users and customers.

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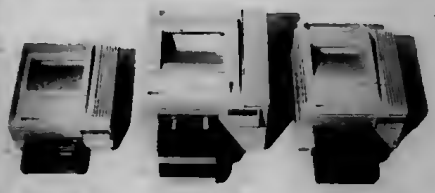

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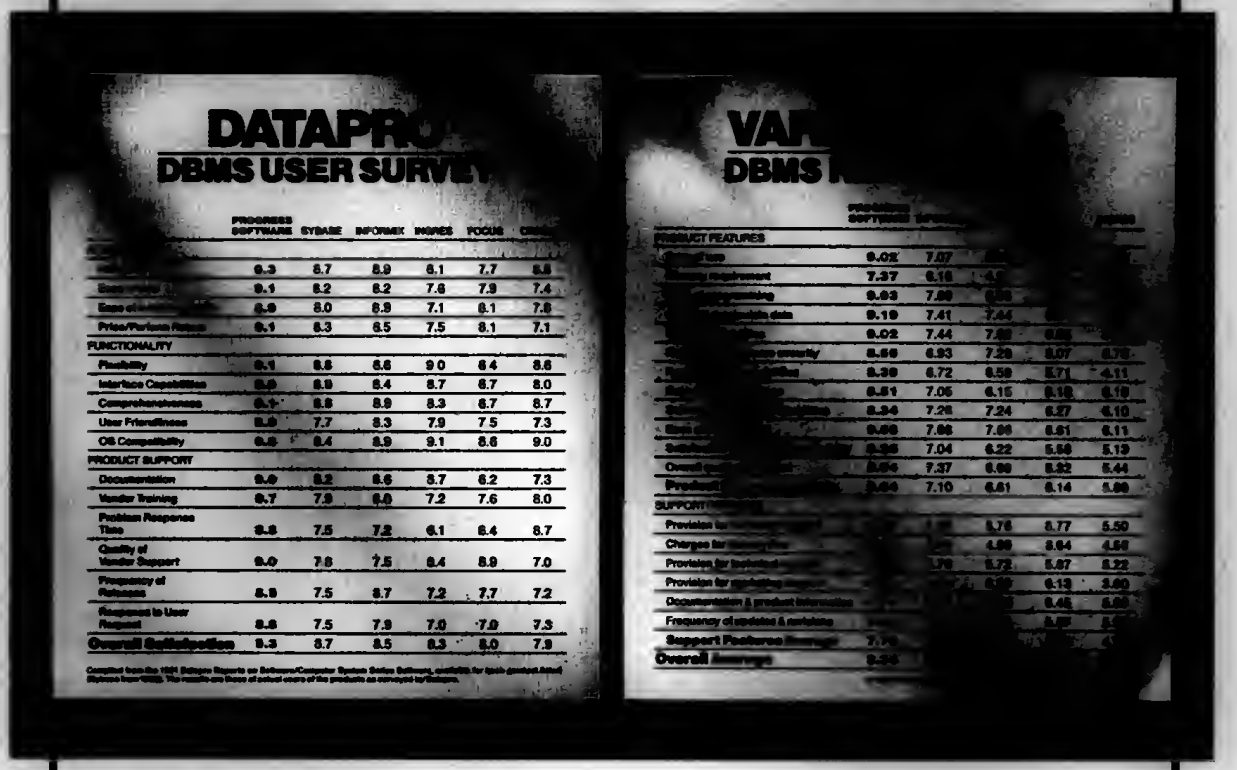

DATAPRO

DBMS USER SURVEY

	PROGRESS SOFTWARE	SYBASE	INFORMIX	INGRES	FOCUS	[illegible]
[illegible]	9.3	8.7	8.9	8.1	7.7	8.8
[illegible]	9.1	8.2	8.2	7.6	7.9	7.4
[illegible]	8.9	8.0	8.9	7.1	8.1	7.8
Price/Performance Ratio	9.1	8.3	8.5	7.5	8.1	7.1
FUNCTIONALITY						
Flexibility	9.1	8.8	8.6	9.0	8.4	8.6
Interface Capabilities	9.0	8.9	8.4	8.7	8.7	8.0
Comprehensiveness	9.1	8.8	8.9	8.3	8.7	8.7
User Friendliness	8.9	7.7	8.3	7.9	7.5	7.3
OS Compatibility	9.0	8.4	8.9	9.1	8.6	9.0
PRODUCT SUPPORT						
Documentation	9.0	8.2	8.6	8.7	8.2	7.3
Vendor Training	9.7	7.9	8.0	7.2	7.6	8.0
Problem Response Time	8.8	7.5	7.2	6.1	8.4	8.7
Quality of Vendor Support	9.0	7.8	7.5	8.4	8.9	7.0
Frequency of Releases	8.9	7.5	8.7	7.2	7.7	7.2
Responses to User Request	8.8	7.5	7.9	7.0	7.0	7.3
Overall Satisfaction	9.3	8.7	8.5	8.3	8.0	7.9

Compiled from the 1991 Datapro Reports on Software/Computer System Online Software, available for [illegible] Annual Reviews from [illegible]. The results are those of actual users of the products as surveyed by Datapro.

VAR

DBMS [illegible]

	PROGRESS SOFTWARE	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
PRODUCT FEATURES						
[illegible]	9.02	7.07	[illegible]			
[illegible] requirement	7.37	6.18	[illegible]			
[illegible]	9.03	7.80	[illegible]			
[illegible] data	9.19	7.41	7.45			
[illegible]	9.02	7.44	7.69	[illegible]		
[illegible] security	8.56	6.93	7.29	8.07	6.78	
[illegible]	8.39	6.72	6.59	5.71	4.11	
[illegible]	8.51	7.06	6.15	6.18	6.19	
[illegible]	8.34	7.26	7.24	6.27	6.10	
[illegible]	8.60	7.08	7.08	6.61	6.11	
[illegible]	8.36	7.04	6.22	5.58	5.13	
Overall [illegible]	8.64	7.37	6.80	6.32	5.44	
Product [illegible]	8.64	7.10	6.61	6.14	5.08	
SUPPORT [illegible]						
Provision for [illegible]	[illegible]	[illegible]	6.76	6.77	5.50	
Charges for [illegible]	[illegible]	[illegible]	4.89	3.64	4.56	
Provision for [illegible]	[illegible]	7.70	6.72	5.67	5.22	
Provision for [illegible]	[illegible]	[illegible]	[illegible]	6.13	5.60	
Documentation & product [illegible]	[illegible]	[illegible]	[illegible]	6.45	[illegible]	
Frequency of updates & releases	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Support Features Average	7.14	[illegible]	[illegible]	[illegible]	[illegible]	
Overall Average	8.24	[illegible]	[illegible]	[illegible]	[illegible]	

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CPWADV0518

Interest in object Cobol grows

Users, vendors predict language will be used to develop new applications

BY GARRY RAY
CW STAFF

Users and vendors are beginning to take a hard look at object-oriented Cobol, despite the fact that an official definition of the language is nearly a year away. And they are convinced that the language will be used to develop entirely new applications, rather than to re-engineer the billions of lines of Cobol code used in existing "legacy" systems.

As one sign of the growing interest in object-oriented Cobol, Micro Focus, Inc. in Palo Alto, Calif., last week announced an early user program for its object-oriented extensions to the Micro Focus Cobol Workbench.

Users said the experimental product will help them get their feet wet in object-oriented Cobol while an official standard — due in April 1993 — is being hammered out by the American National Standards Institute (ANSI) Object Oriented Cobol Task Group.

"We're using it to experiment, to see the benefits and to see what the benefit is for productivity," said Bruce Krapf, senior technical consultant at Philadelphia-based Cigna Corp.

Part of the reason for this early interest, according to several observers, is the current trend toward business re-engineering, in which applications are designed to model and revise business processes. Object-oriented programming (OOP), its advocates say, is well-suited to this task because objects can be used to mimic the elements and processes in a business organization.

"If you can model your business in terms of objects, it's fairly simple to implement [the model] using an object-oriented language," said David Filani, an internal consultant at American Express Co.'s advanced technology group and the company's representative to the ANSI Cobol group.

American Express will begin to use object-oriented analysis and design for some applications as early as this summer, using a variety of object-oriented languages, including Digitalk, Inc.'s Smalltalk and C++, according to Filani. Ultimately, he said, "our plans are on object-oriented Cobol."

Like Filani, some information systems managers and industry analysts expect that object-oriented Cobol will be more widely used than languages such as Smalltalk and C++ because it will require only an extension to existing Cobol skills. "OOP Cobol will have an excellent chance of being accepted by the 1 million-plus Cobol programmers," Krapf predicted.

Citing the relative ease of migrating programmers to object-oriented Cobol environments, George Schussel, president of Digital Consulting, Inc. in Andover, Mass., said, "It will be embraced."

Despite the promise of general acceptance of object-oriented Cobol, observers said they have little hope that it will be used to restructure the billions of lines of "legacy" code said to be in use today. "It won't be useful in re-engineering existing systems," Schussel said, because the supporting class libraries needed to construct object-oriented applications will not work easily with existing programs.

Building these class libraries would not be a useful exercise because "fitting systems from the '70s into systems of the '90s would be a major development effort. The potential is much greater in new systems," said Rich Sutherland, a data processing officer at Connecticut Mutual Life Insurance Co. in Hartford, Conn.

The committee: The Object Oriented Cobol Task Group will submit its recommendation to the ISO and ANSI by April 1993. This will be incorporated into the next revision of the Cobol standard.

The products: Micro Focus in Palo Alto, Calif, is shipping an "experimental" set of object-oriented Cobol extensions to some of its customers. The extensions are based on trends emerging within the task group.

The users: Object-oriented Cobol will be used primarily to develop new applications. Under current scenarios, object-oriented Cobol will not be used to maintain existing Cobol code.

CW Chart: Janell Genovese

CASE project melds stock exchange's data

BY THOMAS HOFFMAN
CW STAFF

NEW YORK — The American Stock Exchange, Inc. is no stranger to the challenge of matching technology to computing demands. The Amex has a variety of systems it is trying to integrate under a single shared, common platform. It is resting its hopes on Oracle Corp.'s computer-aided software engineering (CASE) tools.

The Amex is nearing completion of the first leg of a project called Prospect and Listed Company Information Systems (Palis). The system includes new applications and links between departments. The project was started two years ago with an eye toward linking disparate computer systems in 11 departments, including human resources, payroll, investment banking and investor relations.

According to Paul A. Doughty, director of data processing services at the Amex, the exchange started Palis by building an integrated system between its human resources and payroll departments and using Oracle's fourth-generation language (4GL) tools.

Doughty noted that communications among departments "had been somewhat disjointed in the past." Palis was designed to give all appropriate departments access to what should be common information.

"I think what we are trying to accomplish through the use of CASE tools is to take on larger software development projects that can address the needs of the major function areas within the exchange," Doughty said.

The Amex, which is roughly one-tenth the size of the New York Stock Exchange in terms of transaction volume, handles roughly 160,000 options contracts and 35,000 equity transactions each day. To facilitate these and other operations, the Amex installed an Oracle relational database management system in 1985. The Amex then moved to better examine the intricacies of each department's system by tapping Oracle's SQL Forms Versions 3 and 6 CASE tools, which Doughty said provided the firm with broader flexibility in managing data.

According to Stuart Weiss, senior systems analyst at the Amex who led the Palis project team, senior management at the exchange wanted its data

Continued on page 97

ON SITE

American Stock Exchange, Inc.
New York

- **Challenges:** Integrate disparate systems from 11 departments under one common environment.
- **Technology:** Oracle CASE tools and RDBMS, DEC VAXs and Wang VS minicomputer.
- **Results:** Shared data, smoother communications among departments, elimination of redundant operations.

HP, Silicon Graphics to sell start-up's CASE tool

BY KIM S. NASH
CW STAFF

NATICK, Mass. — A little-known start-up attracted some big allies last week by persuading competing Unix powerhouses Silicon Graphics, Inc. and Hewlett-Packard Co. to resell its software development tool.

Two-year-old Atria Software, Inc., based here, announced that HP and Silicon Graphics will incorporate Atria's version control and configuration management utility for computer-aided software engineering (CASE) projects into their rival CASE frameworks.

ClearCase, Atria's first commercial product since venture capitalists Sigma Partners and Matrix Partners put up $2 million to fund the firm in 1990, is currently in beta testing at Motorola, Inc. and ViewLogic Systems, Inc. Undisclosed business partners have invested another $1.5 million.

The $4,000 product, scheduled for delivery this quarter, helps software engineers organize the various subprojects involved in building large-scale applications, according to Adam Zais, director of marketing at Atria.

"It helps you track changes made by programmers working on different but interrelated parts of the application at the same time," he said.

ClearCase is compatible with CASE tools from other vendors that have signed on to either of two rival Unix CASE framework initiatives: HP's SoftBench or Sun Microsystems, Inc.'s ToolTalk, to which Silicon Graphics subscribes. The companies are taking different tacks to establish their schemes. While HP recruits other vendors, such as IBM, to subscribe to its initiative, Sun bundles ToolTalk with SunOS.

Technically focused

Like ToolTalk and SoftBench, ClearCase is currently aimed at technical Unix developers. But the commercial segment is not out of the question, Zais said.

"It will move into the commercial side at the same pace as ToolTalk and SoftBench," he said. He estimated that process will take 18 months to two years. "We're just trying to stay out of it in the meantime and let them fight those wars."

Atria was formed by nine engineers from Apollo Computer, Inc., which HP bought out in June 1989. Those developers built Apollo's Domain Software Engineering Environment (DSEE), an application development facility for DomainOS workstations.

Part of the impetus for HP signing up Atria were the demands of the some 10,000 DSEE users whom HP supports, according to Frank Reccia, program manager for software development at HP.

Although HP has sold other Unix utilities that perform similar functions to ClearCase, Atria's product will be a better fit for those Apollo users because it was created by the same group that developed the CASE environment they already use, Reccia said.

HP is not an investor in Atria, he added.

COMMENTARY

Thomas Miron

The demise of programming?

Pundits have proclaimed the "End of Nature," the "End of the Modern Era" and even the apocalyptic "End of History." Not to be left out of the millennium mania, I think it's a time to proclaim the "End of Programming."

Conventional programming will be replaced by the End of Programming (EOP) method. EOP links off-the-shelf commercial applications in unique ways to solve business information problems. The enabling technology is already emerging in the form of Object Linking and Embedding (OLE) and generalized macro or scripting facilities under Microsoft Windows.

OLE allows objects generated by one application to be embedded in the output of another application. You can place a color chart inside a word processing document. The chart itself is not placed, but there is a live link to the application and the chart's underlying data.

When chart data changes, so do the contents of the chart appearing in the final document. In effect, the linked charting software becomes a subsystem of the word processor. More to the point, both the word processor and the charting application become subsystems of the final document.

Preparing financial reports

As another example, you could generate a financial report by linking database, spreadsheet, graphics and publishing software to form a final "application."

Instead of writing code to produce the report, you could interactively create setup files and macros that combine commercial programs to generate the desired output. EOP is really a high-level, object-oriented methodology.

In many ways, EOP is a back-door implementation of the high-end CASE model that allows you to visually manipulate data and process icons to create the structure of an application. This symbolic structure is then translated into procedural code. The EOP approach dispenses with the code translation part: When a relationship calls for querying a database, a commercial DBMS is used, not a series of procedural statements.

Dealing with commercial applications as linkable processes or "methods" represents a shift from individual programming statements such as "add," "subtract" or "if . . . then" to placing a check mark next to "set cart type to 3-D" in a dialog box. The vocabulary of development will change from instructions to settings.

As a result of EOP methods, applications will be assembled from off-the-shelf end-user software, and development responsibilities will slide further toward the end user. Expert users will develop sophisticated applications.

Skill set requirements will shift from a process orientation to a data orientation. The most valuable people will be those who understand the meaning of corporate data and understand how to use that data meaningfully.

Process development (programming skills) will be secondary. The ability to communicate verbally and visually with the new graphics-based tools will be even more important than it is today. Technical support emphasis will shift from in-house to vendor phone, fax and bulletin board services.

Two important considerations

Two factors are critical in the development of EOP: commodity pricing for high-powered workstations and the development of reliable object-switching environments.

EOP depends on a distributed processing approach whereby each user is executing one or more commercial applications. The graphical nature of these applications will require fast processors and high-performance video.

If EOP applications are to be widely distributed in a corporate environment, cost must not be prohibitive. Workstation costs continue to trend downward, but high-end commercial software has so far been resistant to price cuts. Site licensing costs will be a critical factor for enterprise applications.

As for a reliable object-switching environment, the prognosis is promising. The competition between Windows and OS/2 should accelerate development of object-linking features. Commercial developers will continue to add object linking as a product differentiation feature.

As with the predicted demise of nature, the modern era and history, proclaiming the end of programming is probably a bit premature. Entrenched applications, skill sets and policies represent enough inertia to keep the old guard going for quite some time. Linkable applications are still rare, and the technology is young. But when the critical factors of availability, familiarity and hardware unite to make EOP methods common, the process we call applications development will be radically changed.

Miron is principal of Miron Infotec, a Madison, Wis.-based consultancy specializing in personal computer-based publishing and technical writing.

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CASE project melds data

CONTINUED FROM PAGE 95

processing services division to take "a sharper look" at redundant processing being done by different departments. The company charged the division with coordinating the integration of departmental operations under one roof.

But the task would not be easy. "We had data quality problems since we had so many different data structures for different departments," Weiss said.

Weiss and his five-person team met with people from departments such as investor relations and human resources to find out which data people in each department required so the Palis project team could draw up a data blueprint.

Palis is based on Oracle's RDBMS, with systems linked together over Digital Equipment Corp.'s DECnet, but Weiss said Oracle's 4GL and CASE tools helped his team reduce the amount of time spent on the project while improving the quality of the data blueprint design.

Weiss estimated that the use of Oracle's CASE tools saved at least a year of labor — valued at $200,000. The investment in CASE tools with related hardware ran at about $100,000.

Looking back at how disjointed the systems were in the late 1980s, Weiss said, "Now, everybody can look at how everyone else's work affects them."

Palis was designed with customized Microsoft Corp. Windows menus. Data is routed between departments using a DEC VAX 3100 file server and a Wang Laboratories, Inc. VS minicomputer handling word processing and electronic mail.

About 40 users are training on Palis. That number is expected to reach 200 within three months. The Amex has 800 employees, with 400 working on the trading floor of the stock exchange.

The next two stages of Palis will address two key issues. Doughty said the company wants to move its networked applications into a Windows environment with a Palis front end on the PC. In addition, the company plans to provide more marketing information across the network, also under Windows.

The exchange is facing other challenges. "We still have the hurdle of user trust to get over," said Bonnie Kreisman, assistant director of systems and programming at the Amex. "People at the exchange are used to controlling their own information. Now, they'll have to share it."

But Doughty is very pleased with what his division has been able to accomplish through the use of CASE tools.

"CASE tools are really, in the end, what enabled the re-engineering approach to be taken on an enterprisewide view of the organization," Doughty said.

NEW PRODUCTS

Database management systems

Westmount Technology has announced the availability of Isee/Accell, an integrated computer-aided software engineering tool environment that generates database applications for a variety of relational database management systems.

Isee/Accell supports RDBMSs from a number of vendors, including Oracle Corp., Sybase, Inc. and Informix Corp. It integrates completely with Unify Corp.'s Accell/SQL fourth-generation language, according to the company. Client applications can run under Microsoft Corp.'s Windows as well as various Unix interfaces.

Applications are developed independently of the database and presentation interface, according to Westmount Technology.

Westmount Technology
Suite 521
5655 Lindero Canyon Road
Westlake Village, Calif. 91362
(818) 597-9119

Development tools

Treehouse Software, Inc. has announced the Natural 2 Organizer Version 3.0.

The change management software runs with Software AG of North America, Inc.'s Natural fourth-generation language. The new version allows multiple target migrations and lets development managers track user enhancement requests through the development cycle.

Treehouse Software
Suite 206
400 Broad Street
Sewickley, Pa. 15143
(412) 741-1677

Compilers

Sequoia Systems, Inc. has announced the availability of an advanced Ada compiler for the company's multiprocessing Unix systems.

The product, developed by Meridian Software Systems, Inc., includes a source-level debugger, code optimizer and a variety of tools and utilities for application development.

It is priced at $50,000.

Sequoia Systems
400 Nickerson Road
Marlboro, Mass. 01752
(508) 480-0800

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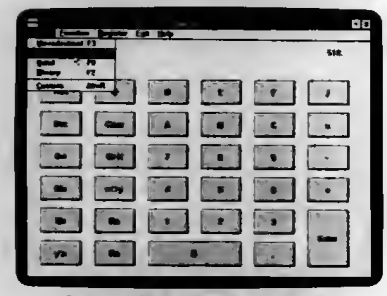

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PRODUCT SPOTLIGHT

Routers

They may not be the most elegant of solutions; they definitely require lots of care. But routers will get your data from one LAN to another.

BY BUDDY SHIPLEY

Someday, local-area network interconnection will cease to be a hair-pulling, painstaking and never-ending process. At that time, routers will be plug-and-play devices with few hassles: They'll be self-managing and will work out all the difficulties inherent in a multiprotocol internetwork.

And someday, too, we'll all be driving electric cars. In the meantime, despite all the headaches they cause, most of us will have to be content with today's version of these interconnection devices, which — despite all the trouble they can cause — aren't so bad as they are complex.

Not only can internetworking products be complex, but they're also one of the fastest growing segments of the networking industry. With the number of vendors approaching 100, everyone, it seems, is getting into the router business: from the internetwork pioneers — Cisco Systems, Inc., Advanced Computer Communications and Proteon, Inc. — to newer companies such as Wellfleet Communications, Inc. to companies established in other areas of computing, such as IBM.

These market forces are turning routers into a commodity device. This forces vendors to differentiate themselves through any means available, such as improved technology or marketing hype to make their products appear superior to their competitors. It's up to you to figure out which features are necessary, which are just nice and which are real.

First off, you must decide whether you need a router at all or whether you could settle for a simpler device, such as a bridge (see story page 100). If you decide that routers are for you, choosing one is not as simple as comparing rated throughput, claimed performance and network interfaces. You need to get an understanding of your organization's requirements, the available technology, internetworking concepts, standards, industry direction and who the vendors are. A good way to start is to look at the following router requirements:

- Does it support the necessary communications protocols, LAN access methods and interfaces and wide-area network interfaces?
- What kind of network management is available?
- What sort of path selection protocols does it support?
- Is the vendor reliable and stable, with good technical support?

Illustrations by Timothy Cornell

Routers of several years ago supported only a single local interface, one or two remote interfaces and a single protocol — Transmission Control Protocol/Internet Protocol (TCP/IP). Today, most routers are capable of supporting multiple protocols and interfaces simultaneously.

The small, limited-capacity routers are still available from several vendors, although they are generally provided only to complement the larger modular and expandable routers in the product lines. The smaller units are most often used in small satellite offices, whereas the larger units are installed in larger offices and headquarters.

Routers can also support concurrent communications among several different LAN access methods such as Ethernet, Token Ring and Fiber Distributed Data Interface (FDDI). However, they can provide communications only between nodes that use the same protocols, such as TCP/IP, IPX, DECnet, XNS, CLNS or AFP.

For example, a router can provide communications between a Novell, Inc. NetWare (IPX) user on an Ethernet LAN and a NetWare (IPX) server on a Token Ring LAN. It cannot provide communications between that NetWare user and a Unix (TCP/IP) server or host.

Because routers use Network Layer address information, they can also determine the shortest, fastest, most economical or best internetwork path between any two nodes.

"Best path" can mean the least number of hops between end nodes; the path with the highest data rate; the cheapest, most cost-effective, least congested or cleanest path; or a combination of these. But this selection is usually made by processes that are inaccessible to the user, the values for which are often unalterable.

Different protocols use different route-path selection protocols, and some router vendors use additional route-path selection protocols to provide enhanced internetwork capabilities.

These "inter-router communications protocols" — which include Router Information Protocol (RIP), Interior Gateway Routing Protocol (IGRP), Open Shortest Path First (OSPF) and Intermediate System-to-Intermediate System (IS-IS) — operate invisibly in the background to dynamically maintain a path between routers.

Of these, RIP is the most common. However, at this point, many large organizations (in addition to the Internet) have almost pushed RIP to its technical limits.

Long ago, in response to

Continued on page 100

Shipley is an independent consultant and president of Silver Spring, Md.-based Shipley Consulting International. He publishes the "LAN Digest" newsletter and has just completed the *Ethernet Pocket Reference Guide*.

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Throughput is certainly no face-value statistic. Page 103.

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Routers get data where it's going

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these limitations, Cisco developed IGRP for use as its own inter-router protocol with IP. In addition, the Internet Engineering Task Force developed OSPF, and the International Organization for Standardization (ISO) developed IS-IS. Most router vendors have already announced support for OSPF, and some are shipping products now. OSPF can coexist in the same network with RIP, which permits a gradual transition from RIP to OSPF. OSPF can also run in parallel with RIP.

Most network operating system vendors have also developed their own route-path selection protocols, usually based on RIP. However, the vendors modify them enough to prevent them from interoperating with other implementations of RIP used by other communication protocols.

Until recently, users had no choice in route-path selection protocol. Now, TCP/IP users do have a choice: good old RIP or OSPF.

Another protocol of primary importance is the network management protocol. Most routers support the Simple Network Management Protocol (SNMP) and a management information base (MIB), including MIB I or MIB II, and some proprietary MIB extensions. A MIB is a database listing of manageable objects in the routers and other network devices. These devices send signals via SNMP to a management station where the network administrator can monitor them and effect changes.

What you have to be wary of is the extent to which the vendor can support MIB objects. Some MIB objects are read-only and are only meant to gather statistics and be queried from an SNMP management console. Other objects are read/write, meaning they can be enabled, disabled and reset. Some vendors may not fully support the read/write capability, so ask and test for yourself.

Some vendors also support IBM's NetView or Digital Equipment Corp.'s DECmcc Director, while others have announced intentions to support the ISO's Common Management Information Protocol/Services. Of course, some vendors provide only their own proprietary solution, which is to be avoided.

Remote router management is also very important, since the majority of an organization's routers are likely to be geographically dispersed. Virtually all routers support and can be managed remotely via SNMP. Most routers provide a console interface to which a terminal or modem may be connected. It is through this interface that most routers are first configured for use, and it can be used as a remote access point into the router for service purposes.

Some routers also support the virtual terminal features of TCP/IP's Telnet utility. Once a router with Telnet is accessed either in-band or out-of-band, the user may Telnet from that router out of any interface, into any other device that supports Telnet, including Unix hosts. It is an extremely handy feature to have.

Especially for routers in remote sites, reliability is one of the most important considerations for information systems managers. Mean time between failure (MTBF) is the usual way of reporting reliability statistics, and so far, Advanced Computer holds the top position on that. It claims an MTBF of more than 15 years for many of its products. This is a conservative estimate based on average failure/return rates of equipment in the field.

Your users will likely have their own selection criteria, not the least of which is speed. Router performance is typically rated by the same two statistical variables as bridges: filtering rate and forwarding rate, both measured in packets or frames per second.

Nothing is as questionable as these statistics in comparing one router to another (see story page 103). For one thing, the statistics rarely reflect what the speed would be if the router were connecting dissimilar LANs (Ethernet, Token Ring, FDDI), which they often do. Each LAN type uses a different frame size and frame structure, so a router must go through a long, complex process before transmitting the frame or frames onto the destination network. A simple packet/sec. statistic in such a situation becomes meaningless.

Another speed issue that is overrated is backplane speed. Some vendors are currently touting backplane buses in the gigabit/sec. range. The number they're reporting is frequently the aggregate speed of multiple logical backplanes, only a fraction of which are being used in a given configuration. The unused bandwidth is often destined for future expansion to provide support for interfaces such as FDDI that demand more bandwidth than Ethernet or Token Ring.

More backplane speed does not necessarily buy greater throughput. For instance, Ethernet operates at 10M bit/sec., Token Ring at 4M or 16M bit/sec. and FDDI at 100M bit/sec. These LANs will continue to run at those speeds, regardless of the speed of the routers interconnecting them.

Still, the gigabit/sec. router backplanes are not without purpose. They buy a piece of the future and can support virtually anything users can throw at them today.

No matter which router you choose, be sure to contact the vendor's references before committing to anything. Don't use just any old reference: Ask the vendor for someone who is using the same equipment in the same configurations with the same protocols as you will be.

Above all, do not cut corners now; this is the wrong place to be cheap. Establish an in-house pilot network to thoroughly test the chosen products before actual implementation. Finally, be sure to educate the staff and keep them current in the latest emerging technologies. •

'Best path' protocols

RIP: Consists of a simple, vector-based, hop-count metric that does not take into consideration link speed, cost, quality or congestion dynamics. All routers broadcast their entire RIP database across the internetwork every 60 seconds, whether or not there has been a change in status.

OSPF: A more complex link state algorithm that allows a router to dynamically monitor status changes of each link and broadcast changes immediately. Rather than broadcasting their entire OSPF database, routers transmit only the changes, which consumes less bandwidth.

IGRP: An enhanced version of RIP that is proprietary to Cisco. It is argued that IGRP is just as good as — if not superior to — OSPF, but it is proprietary.

BUDDY SHIPLEY

The lineup

The following companies offer products that provide good protocol support for Ethernet and Token Ring. High-end routers in each product line performed competitively in the Harvard University benchmark tests in October 1991.

▶ Advanced Computer.

Strengths: A good menu-driven user setup interface. Hot-swap capability allows routers to be reconfigured without bringing down the network. High marks on product quality and customer support. Nearly full fault-tolerance.

Weaknesses: No Telnet capability. No IBM Systems Network Architecture (SNA) or ISO CLNS routing offered yet. No FDDI.

▶ Cisco Systems.

Strengths: Broad protocol support and full range of router sizes. Supports Telnet. Throughput on the Cisco AGS product is one of the fastest in the industry. Reliance on nonvolatile CMOS configuration provides for fast reboot while eliminating a floppy drive as a potential point of failure. Good SNA support.

Weaknesses: High reported maintenance costs. No fault-tolerant product offered. User setup interface via scrolling-menu command line is a common complaint. Interface modules of several router chassis are difficult to access.

▶ Proteon.

Strengths: Vendor with the most Token Ring expertise. Broad protocol support and advanced reduced instruction set computing (RISC) technology. Flexible support for SNA routing and has announced DECnet Phase V routing as well. Analysts have praised the Proteon CNX-500 for its use of advanced RISC technology and its price/features and performance ratio.

Weaknesses: Limited range of router sizes. The P4100 is built on a PC platform, and the earlier P4200 costs more and offers less than the new RISC-based CNX-500.

▶ Wellfleet Communications.

Strengths: Broad protocol support and full range of router sizes. A good menu-driven user setup interface; supports Telnet. Directly routes IPX over wide-area network links and offers a wide selection of IPX-specific filters. Ease of hardware serviceability — just two screws on back to gain access to all interface modules. Floppy disk drive and CPU modules are accessed from the front panel.

Weaknesses: Dependence on floppy disk drive as the only boot device renders the routers vulnerable to catastrophic failure in the event of drive or floppy failure. Performance problems with Token Ring have been reported by several sources. A relatively new player in internetwork router market.

BUDDY SHIPLEY

The simple world of bridging

Whenever routers are the topic of discussion, bridges are inevitably included. It's important to understand the differences between them.

Essentially, bridges are a simpler technology than routers. They operate at a level below that of routers on the Open Systems Interconnect model, at the Media Access Control (MAC) sublayer of the Data Link Layer.

Bridges base their filtering and forwarding decisions on the MAC address found on all network interface cards. The forwarding database of a bridge is built and maintained automatically, making bridges almost as simple as plug-and-play — there's no configuration to be done.

Routers, on the other hand, filter and forward information based on higher level protocols and network-layer addressing schemes. But while this makes them more flexible, routers are also more difficult to configure. Setup includes configuring the selected protocols, network addresses, interfaces and management facilities.

Think of it like the telephone system: Using a bridge is akin to just having to dial within a single area code. The bridge wouldn't have the addressing schemes to get you into another area code or even country code. That would require the smarts of a router.

Routers are able to make more efficient use of all available links in the internetwork by using them all concurrently. Bridges, on the other hand, depend on the Spanning Tree Protocol to manage redundant links and paths: Unless the vendor has implemented a proprietary link management protocol, one of the redundant links or paths is forced into a blocking state in which no data is forwarded. This is not usually a problem in local-area networks, but for wide-area networks, it is uneconomical.

Still, for some systems, routers may be entirely inappropriate or may not work at all. Digital Equipment Corp.'s LAT and IBM's NetBIOS (or NetBEUI) contain no routing address information and are therefore nonroutable protocols.

Most vendors now offer a bridging or encapsulation option for those protocols. But for users who only need to bridge NetBIOS or LAT protocols, bridges will always be simpler to install and maintain and will usually cost somewhat less.

Bridges are no longer faster than routers. Because of higher speed buses, 32-bit CPUs and software performance enhancements, routers are now frequently as fast as or faster than bridges.

BUDDY SHIPLEY

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Consider your alternatives

Routing functions are obtainable without buying routers

You don't have to purchase a router to get routing functions. There are at least two alternatives.

Some of the most common routers are the "internal bridges" included with such network operating systems as **Banyan Systems, Inc.**'s Vines, **Novell, Inc.**'s NetWare and **Microsoft Corp.**'s LAN Manager.

These routers only require you to add a network interface card in the file server and make sure the network operating system is aware of the new card. The file server now contains two or more network interface cards, with each supporting a different logical network.

By comparison, external routers require a personal computer, two or more network interface cards and the router software.

A second router variation uses an ordinary PC, two or more network interface cards and a router software program that supports one or more communications protocols. These are available from vendors, such as **Gateway Communications, Inc.** and **Eicon Technology Corp.**, which support both local and remote connections. These routers are a good economical alternative for firms that cannot afford a specialized router.

There are concerns about these PC-based router solutions, however. For one, you are creating a single point of failure for many critical functions. Should either the router or the file server require maintenance, both functions may be disrupted. Second, typical PCs — even those used as file servers — are not exactly known for their reliability. The mean time between failure of most router products far exceeds that of the conventional PC.

Other drawbacks include the throughput capacity of the PC's bus, its CPU, the CPU clock speed and the internal data path. Also of concern is the reliance on the PC operating system — DOS, which is not known for its speed and may render the router susceptible to computer viruses because the router usually boots from a hard or floppy DOS disk. Another issue is the potential for incompatibilities in various PC clones that can thwart any would-be simple installation.

The majority of file server-based routers support only one protocol — that of the network operating system vendor. LAN Manager supports either NetBIOS or TCP/IP but not both concurrently. Vines is based on a Unix kernel and uses a derivative of TCP/IP (and XNS) as its native protocol. As a result, the server's internal router does not handle true TCP/IP forwarding such as that required by **Sun Microsystems, Inc.**'s workstations and servers or other Unix hosts.

An exception to many of these limiting factors is NetWare v3.11, which now supports TCP/IP along with its native IPX protocol suite. Added protocol support can be provided via Novell's NetWare Loadable Modules. Also, because the NetWare server does not run DOS, it is not susceptible to DOS, the Apple Computer, Inc. Macintosh or Unix viruses.

BUDDY SHIPLEY

You may want more than one

One heavy-duty router or many smaller ones? That is yet another purchase decision you'll have to make.

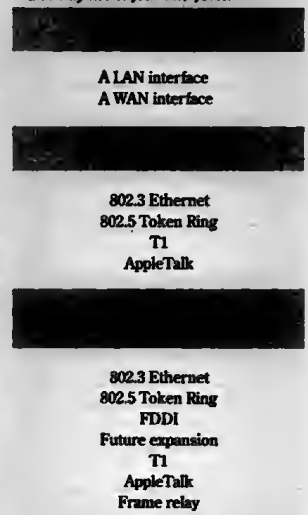
The answer, of course, depends on the size and distribution of your sites. The following scenarios give you an idea of what configuration is best for them:

- **All geographically remote sites are roughly equal in size, number of users and demand.** The requirements of each site could be met with the same size router unit or model.
- **Sites range in size from a large headquarters to medium-size remote offices to small satellite offices or shared office suites.** Each site will have varying needs and will place varying levels of demand on the network link or links. This scenario warrants a different size unit suitable for each site.
- **Sites are situated in close geographical proximity to one another, such as at a campus.** One large, centrally located unit supporting optical fiber cable running to each of the sites could satisfy all requirements. For sites or buildings housing several discrete subnetworks, separate fiber cables and router interfaces for each subnet could still satisfy all interconnection requirements.

Alternatively, a high-speed FDDI backbone network could be installed between all buildings. Each building would have its own router with enough interfaces to accommodate all departmental subnetworks in that building. The only devices connected to the backbone would be the routers and some host computers supporting a direct FDDI interface.

Find your size

Several vendors offer a range of chassis sizes with varying capabilities. The smaller units are frequently fixed in size, offering few configuration options and only two or four interfaces.



Source: Shipley Consulting International
CW Chart: Janell Genovese

Watch those router speed stats

Comparing throughputs can be same as apples to oranges

BY SCOTT BRADNER

It was not until 1756-1760 that England established an independent reference for one of its most common units of measurement: the yard. Up until that point (and a bit afterward, despite the specific legal abolishment of all variants), a "yard" could mean anything from 35.66 in. to 37.06 in. and even, occasionally, 40 in.

What does that have to do with routers, you ask? Well, we are currently at the prestandard stage in the characterization of router performance. One vendor's "throughput" figure may refer to the number of packet/sec. that make it out of the router when the input is being bombarded with a full Ethernet's data stream, even though 30% of the packets are being lost. Another vendor might report the highest rate at which the router can correctly process a stream of packets.

The first "throughput" may be almost useless in understanding how a router will affect the usability of a data network. The second may present an artificially low value, since the router loses one packet in 100,000.

To help matters, the IETF Benchmarking Methodology Working Group (BMWG) is in the process of establishing some standards. Its RFC 1242 "Benchmarking Terminology for Network Interconnection Devices" defines terms such as throughput (the maximum rate at which all offered packets are processed) and packet size.

There are a number of device characterizations that the BMWG believes could be useful in understanding how particular routers would operate in a specific network environment:

- The latency through the router under high and low loads.
- The router's ability to deal with bursts of back-to-back packets.
- How the router operates in an overloaded state.
- The recovery time from a reboot or power outage.

Bradner is a consultant at Harvard University, where he works on applications for the campus data network. He is also the director of the Harvard University Network Device Testing Laboratory.

A few vendors have developed software that can be used to measure many of these characteristics. Some examples are Research Triangle Park, N.C.-based Wandell & Goltermann Technologies, Inc., Fremont, Calif.-based Alantec, Calabas, Calif.-based Tekelec and Proteon, Inc.

Testing on their own

Some users simply purchase the software — which sells for roughly $35,000 to $50,000 — for themselves and do their own test comparisons. However, it's becoming common practice to insist that your potential vendors use the testing software to ensure an apples-to-apples comparison among them.

Of course, these measurements need to be made with traffic that simulates as closely as possible the conditions on your own network, including the mixtures of protocols, packet sizes, broadcast traffic and data rates you plan to use.

The Network Device Testing Laboratory at Harvard University has been used to characterize routers and bridges. A test of multiport routers, performed last fall (see chart), showed throughput values measured for a single stream of data through a number of routers.

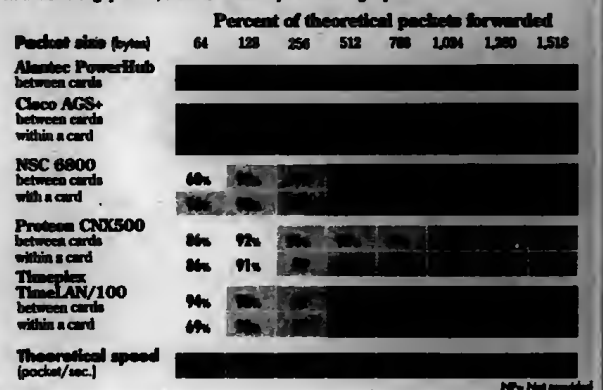
The data stream was run from a port on an Ethernet interface card to another port on the same card (within) and from a port on one interface card to a port on a second card (between). These tests were performed with the Alantec PowerBits tester and conform to the terminology definitions in RFC 1242 and the procedures in the methodology draft.

It should be noted that throughput performance by itself should rarely be the determining factor in the selection of a router. It should come into play only after examining other factors, such as user interface, management controls, customer support and documentation.

This test lab is used twice a year to perform a series of tests open to all vendors. The results of the current round of tests, which include FDDI and Token Ring routers and bridges, will be reported at Interop '92 Spring in Washington, D.C. at the Birds of a Feather conference on Wednesday, May 20, at 7:30.

Lost packet department

In a '91 throughput test, some routers lost packets at high speeds



Source: Harvard Network Device Test Lab

CW Chart: Janell Genovese

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Those *!@?#$ routers!

The poor, maligned router. Sales may be soaring, but on a personal level, it's about as popular as a "Dan Quayle for President" bumper sticker. IS workers complain of configuration problems, troubleshooting difficulties and more. Truth be told, it's not really routers causing all the headaches; the blame is more accurately pinned on the complexity of internetworking a lot of LANs with a lot of different protocols. Just the same, here are some trouble scenarios to peruse, whether you're looking for solutions or just a shoulder to cry on.

Crashing servers

STEVE COPPEL HAD JUST FINISHED upgrading the microcode in his company's 17 CrossComm Corp. ILAN routers when . . . Crash! Down went two file servers running Novell's NetWare 2.15.

The culprit was obvious: The microcode in the router was the only thing that had changed overnight. But what exactly was the problem?

Coppel, telecommunications executive at Baltimore-based First National Bank of Maryland, first checked into the file server errors with Network General Corp.'s Network Sniffer. There he discovered excessive frame copy errors. That, combined with the communications overrun alerts being picked up on the Microsoft Corp. LAN Manager console (used for system administration), told him that the file servers were receiving more frames than they could handle.

Coppel also noticed that "the problem only manifested itself on busy [LANs]. Crashes occurred when other personal computers entered and left the ring." It's normal for a PC entering or leaving the ring to create a burst or line error, Coppel continues, "but we found that excessive amounts of those errors were causing the file server to crash."

To solve the problem temporarily, Coppel installed a bridge between the workstations and servers to isolate them. He then reported what was happening to CrossComm, which worked with Novell to discover that the NetWare 2.15 servers contained an old Token Ring driver that wasn't written exactly to spec. Coppel eventually installed new drivers to solve the problem.

Compatibility woes

WHEN YOU PURCHASE your systems from a single vendor, you don't expect compatibility problems. That's what Bill Owens figured when he purchased eight routers from a single source.

But life in internetworking is rarely that simple. "When we discover a bug and the vendor sends us software to fix it, the new release usually has some added features that create compatibility problems with the other routers," says Owens, network engineer at the University Computing Services at the State University of New York (SUNY) at Buffalo. As a result, the routers often crash. "It's unusual for us to go more than 36 hours without a router crash," he says.

On top of that, Owens often has to upgrade his hardware to accommodate the more powerful software upgrades. SUNY currently routes DECnet, IPX/SPX and LAT over its network.

Owens' temporary solution is to direct his complaints to the vendor's bulletin board service. Unfortunately, his vendor refuses to publicize other users' questions and "bug finds."

Owens is considering replacing the routers with another vendor's equipment, but right now he's "too busy" keeping everything up and running. His advice is to contact users before purchasing equipment, and he is willing to share his experience with prospective buyers. Owens can he reached via electronic mail at Owens@ASCU.Buffalo.edu.

Incorrect configuration

HOW DO YOU SPELL "HEADACHE?" "Router configuration," according to Todd Luttinen, communications analyst at Chevron Information Technology Co. in San Ramon, Calif.

Luttinen knew he was heading for the aspirin bottle when certain addresses in one of Chevron's subnets suddenly became unreachable from other subnets.

The company manages a WAN for Chevron Corp., its parent corporation, that spans 35 cities and runs TCP/IP. The workstations are connected via Token Ring, Ethernet and serial LANs, which are in turn hooked together via private lines and X.25 networks using 40 Cisco Remote Token Ring and Remote Ethernet Routers.

To get an idea of what the problem was, "we verified that we could 'ping' some subnets and not others over the router," Luttinen says. Ping is a diagnostic built into TCP/IP that sends a round-trip signal to the host.

As it turned out, Luttinen had mistakenly configured the last router he had installed with an 8-bit rather than a 7-bit mask. Cisco's routers were designed to reset all the masks on a particular subnet to conform to the settings of the last one configured.

"It was apparent that the problem was a subnetting mask problem," Luttinen says. "With a 7-bit subnetting mask, you can access hosts with both even or odd addresses. With an 8-bit subnet mask, you can access hosts with even or odd addresses but not both." Luttinen simply configured the routers to get thing running smoothly again.

*!@?#$

"Our biggest problem is that the software isn't stable. It's unusual for us to go more than 36 hours without a router crash." ***Bill Owens, network engineer, SUNY, Buffalo.***

"Our users would see printers that weren't on-site and, without realizing it, send jobs to a printer in New York." ***Wayne Brandt, senior programmer/analyst, Ciba-Geigy, Summit, N.J.***

"It wasn't impossible [to configure our Proteon routers]. But the documentation assumes you understand FTP and IP, so there was some frustration." ***Don Elledge, systems programmer, Central Soya, Fort Wayne, Ind.***

Faulty hardware

IF BRUCE MIETH'S EXPERIENCES are any indication, WAN administrators have to he part detective and part saint to troubleshoot router problems.

It all started in June 1991, when Mieth, systems integrator at Lincoln Telecommunications Co. in Lincoln, Neb., upgraded to Advanced Computer's Version 3.1 of its 4400 line of routers. Mieth presides over a complex internetwork that spans three facilities. Each site has several subnetworks.

Advanced Computer 4400 routers communicate in all of the environments — which include DECnet, Lantastic, LAN Manager and Systems Network Architecture networks running on Token Ring and Ethernet hardware — via TCP/IP. The routers also work with T1 links to connect the three sites.

"For the first two or three weeks [after the upgrade], we saw a 20% increase in throughput," Mieth says. "But toward the end of June, we began to have problems with remote sites. Responses became slow and intermittent."

Thinking there might he a T1 problem, Mieth called the phone company in to look at the T1 circuit, but everything checked out fine. Next, he used SNMP to disable one of the T1 lines. The router selected an alternate route to the other building.

"That treated the symptom," Mieth says, "but we still didn't have a solution."

When Mieth explained the problem to Advanced Computer, the firm realized it had a bug in its Version 3.1 software, and Mieth installed the fix at the end of July.

But the router bug had masked another problem. "At the end of August, the link started acting up again," Mieth says. "Some file transfers would cause the system to lock up." So Mieth changed the cabling from unshielded ribbon cable to shielded twisted-pair between the end of the T1 link and the CSU/DSU. But error counts remained high.

The next step was to take the T1 link off-line and check the circuit's integrity. It turned out the trouble wasn't with the router. "After all our testing, the diagnostics revealed that it was the DSU," Mieth says. "We replaced [it] and haven't had any problems since."

Conflicting addresses

ADDRESSING PROBLEMS is one of the major sources of trouble for routers on WANs, as Art King, senior operating systems specialist at Portland, Wash.-based PacifiCorp, discovered.

He knew something was wrong when "people were sometimes able to access the Portland site and sometimes weren't," King explains. PacifiCorp has an Ethernet WAN that consists of 70 subnetworks. The LANs are tied together on a StrataCom, Inc. fast-packet backbone and 70 routers from Advanced Computer.

To figure out what was wrong, King logged onto a Sun Microsystems, Inc. workstation that was having trouble accessing the Portland site. The Address Resolution Protocol table showed that the Portland router's Media Access Control (MAC) address kept changing.

When King used Network General's Sniffer to confirm this, he discovered that the IP address that corresponded to the router's IP address was alternating between two MAC addresses. This meant that two devices — a router and a workstation — were sharing the same IP address and that both were answering requests for the router's services. When the workstation responded first, it would send back a message saying that the network was unavailable.

King sent someone out to hunt down the offending node and change its IP address. "We've got thousands of nodes," he says, "and we don't keep lists of what machine has which MAC address."

The company did that remotely, using Sniffer.

Right data; wrong place

ONE OF THE BASICS of communications is getting data to the right place. But sometimes even the basics aren't easy. Ask Wayne Brandt, senior programmer/analyst at Ciba-Geigy in Summit, N.J.

Ciba-Geigy has had an ongoing problem with network traffic from remote LANs surfacing in unexpected places. For example, the New Jersey LAN nodes were seeing traffic that should have remained local to the New York LAN.

Isolating the traffic proved difficult with routers. The better option turned out to be smart hubs with routing cards, especially since Ciba-Geigy was about to install networking equipment in a new building. As it turns out, the hub-based approach makes it easier to filter out unwanted traffic, Brandt says.

"We chose SynOptics as the site standard," he says. "The management software runs under Microsoft Windows and is easy to use."

Sluggish response

ALL WAS NOT WELL at the Bellevue, Wash, school district. Paul Weber, data processing supervisor, was involved in a two-year project to connect Apple Computer, Inc. AppleTalk-based subnetworks in each of 31 schools to a districtwide Novell NetWare 3.11-based WAN.

"As we added networks to the system, we started to see a slowdown in activity over the network," Weber says.

At the time, the school district was using only the bridging functions of Advanced Computer's 4100 and 4400 routers to link the subnetworks to the WAN. Currently, nine of the sites are connected to the WAN via routers and 56K-byte links.

Because the network uses multiple networking protocols, Weber began his troubleshooting by looking at the types of packets coming across the network. "We found that the Macs were putting out the majority of the packets," Weber says.

The solution was to place a different router, Cayman Systems, Inc.'s Gatorbox, between the Macintoshes and the Ethernet and to use its masking function to keep some of the Macintosh traffic off the main network.

Now that he has cleared up the Macintosh traffic, Weber is looking at the Novell network, which put out the next highest amount of traffic. "It's a matter of optimizing performance," Weber says. "When the network is small, with less than 150 users, I would just use [the router] as a bridging device and wouldn't bother with the routing functions. But as the network grows, the issues become larger."

Upgrade-itis

ON THE WHOLE, Maynard Leistiko, network analyst at Boeing Computer Services in Philadelphia, feels he's been a lucky guy. Boeing-Philadelphia operates about 10 Cisco routers to transport its IP data; all other protocols are bridged. So far, problems have been minimal.

"The only criticism I have is that there are a lot of updates," Leistiko says. Because the whole company has to stay on the same upgrade level, Leistiko needs to keep in sync with other major Boeing centers in Seattle.

To avoid problems, Boeing's policy is to test and implement configuration changes on Sunday night, lessening the impact on network availability during business hours. Boeing's strategy is to "pick a release level, test it and then live with it a while."

Leistiko's group also benefits from talking with other Boeing sites before making changes. "Our own lab tests out the router when we're going to do a new configuration," he explains.

By adhering to company policy and limiting the number of protocols routed, Leistiko has been able to maintain a fairly smooth-running operation.

These stories were written by Cheryl Goldberg, a free-lance writer based in San Francisco, and Jill Huntington-Lee, president of Brandywine Network Associates, a consulting firm in Cinnaminson, N.J.

What's new in the marketplace?

BY SUSAN FRANKLE

What *isn't* new in the router market? Vendors of these devices are tumbling all over themselves to introduce new features. Especially in the past year, vendors have concentrated on taking routers beyond their origins in the government, university and technical/engineering markets into general-purpose computing. Here are some of the most recent developments:

- **Routing SNA.** One of the key differences between technical and commercial sites is the presence of Systems Network Architecture (SNA) in many IBM-oriented shops. Today, however, traditional SNA is not routable and therefore is virtually never integrated with LAN traffic.

Router suppliers are attempting to overcome this limitation by encapsulating SNA traffic within TCP/IP or other routable packets. Although this permits wide-area network traffic to be consolidated, it also introduces some WAN traffic overhead.

All of the major router vendors — including **Cisco Systems, Proteon, Wellfleet Communications** and **3Com Corp.** — are developing products that perform this function. But the only ones currently offering it are Proteon and Cisco, both of which started shipping their products in October 1991.

Beyond encapsulation, some router vendors are looking to license IBM's Advanced Peer-to-Peer Networking node. 3Com has stated that it will license this protocol to incorporate in its routing software.

- **Token Ring support.** This is fast becoming an essential check-off item for commercial customers, especially because of the performance limitations of IBM's Source Route bridges in complex networks.

During the last several months, most router vendors have announced and/or rolled out their Token Ring support strategies, with some enhancing performance from 4M to 16M bit/sec. implementations.

In mid-1991, Cisco added a 16M/4M bit/sec. board to its midrange and high-end routers. The company plans to introduce in mid-1992 Token Ring boards with multiple ports.

Wellfleet and Proteon are also beefing up their Token Ring offerings. **Advanced Computer** has 16M/4M bit/sec. Token Ring support on its router platforms.

- **Frame-relay support.** In the last year, frame relay has emerged as a high-end option for LAN-to-LAN connectivity over WANs, with its primary benefit being cost-effective data transmission for multiple remote connections. Leading router vendors offering frame-relay interfaces include Cisco, Wellfleet, DEC, Proteon, 3Com and Advanced Computer.

There are impediments to frame relay's widespread acceptance. These include confusing pricing structures from the carriers and a general lack of understanding by customers of their wide-area data traffic levels.

- **Fault-tolerant, redundant hardware architectures.** Redundant power supplies, hot-swappable components and fault-tolerant bus architectures are new capabilities for high-end multiprotocol routers. Although nothing is currently available in this area, Wellfleet's Backbone Node — the company's high-end offering scheduled to ship sometime this year — attempts to address these commercial requirements. **Coral Network Corp.** also announced a multiprotocol router with many of these capabilities.

Frankle is a senior analyst, LANs, at International Data Corp., a market research firm in Framingham, Mass.

The SNA way

If you're interested in a router that can encapsulate (and thus "route") IBM's SNA, there are some caveats that you should understand.

To route SNA, the SNA frames are usually encapsulated within the frames used by TCP/IP. The routers are usually configured to provide point-to-point virtual circuits between selected SNA routers on the internetwork.

These circuits are static in nature and are manually configured and maintained. Such configurations demand a complete understanding of each of the environments involved and are not a simple undertaking.

Additionally, the term "SNA" encompasses all of IBM networking, including its various cabling systems and network access methods, communications protocols, utilities and management services. When a router vendor claims to provide support for SNA, the interfaces must be defined as well.

Most vendors support only a subset of the SNA protocol suite over a serial Synchronous Data Link Control or 4M or 16M bit/sec. Token Ring interface. Support for the IBM 3270 serial interface is nonexistent, and only a few vendors such as Advanced Computer and McData Corp. support a direct channel attachment to an IBM host or front-end processor.

BUDDY SHIPLEY

Multiprotocol routers with bridging capabilities

VENDOR	PRODUCT	CHASSIS SIZE*	INTERFACES SUPPORTED (LOCAL)	INTERFACES SUPPORTED (REMOTE)	LAN LIMITATIONS	PROCESSOR TYPE	PROCESSOR SPEED (MHZ)	ROUTABLE PROTOCOLS SUPPORTED	INTER-ROUTER PROTOCOLS SUPPORTED	SNA FEATURES SUPPORTED	TELNET SUPPORT	NETWORK MANAGEMENT SUPPORTED	BACKPLANE SPEED	BACKPLANE USED TO DETERMINE SPEED	MAXIMUM THROUGHPUT (PACKET/SEC.)	BRIDGING OPTIONS	BASE PRICE
Advanced Computer Communications (800) 638-4455, (800) 444-7854	ACCn 4000	Large	Ethernet: 11 802.3 10Base-5, 10Base-2; Token Ring: 802.5 4M/16M bit/sec.	WAN Protocols: 20 HDLC/LAPB, X.25, frame relay; WAN interfaces: V.35, RS422/449, RS232, EIA530, X.21	None	Motorola 68030	25	IP, XNS, IPX/SPX, DECnet, AppleTalk	RIP	None	No	SNMP	Dual bus 10M bit/sec., 320M bit/sec.	Multiple channel	5,000	IEEE 802.1D with Spanning Tree, IBM Source Routing	$14,995 - $38,995, depending on hardware configuration
	ACS 4400	Large	Ethernet: 6 802.3 10Base-5, 10Base-2; Token Ring: 802.5 4M/16M bit/sec.	12 WAN protocols: HDLC/LAPB, X.25, frame relay; WAN interfaces: V.35, X.21, RS422/449, RS232, G.703, DSX-1	None	Motorola 68030	25	IP, XNS, IPX/SPX, DECnet, AppleTalk	RIP	None	No	SNMP	NA	NA	5,000	IEEE 802.1D with Spanning Tree, IBM Source Routing	$5,750 - $32,500, depending on hardware configuration
	ACS 4300	Small	Ethernet: 2 802.3 10Base-5, 10Base-2; Token Ring: 802.5 4M/16M bit/sec.	3 WAN protocols: HDLC/LAPB, X.25, frame relay; WAN interfaces: V.35, X.21, RS422/449, RS232, G.703, DSX-1	None	Motorola 68030	25	IP, XNS, IPX/SPX, DECnet, AppleTalk	RIP	None	No	SNMP	NA	NA	5,000	IEEE 802.1D with Spanning Tree, IBM Source Routing	$7,500 - $9,000, depending on hardware configuration
	ACS 4100	Small	Ethernet: 1 802.3 10Base-5, 10Base-2; Token Ring: 802.5 4M/16M bit/sec.	2 WAN protocols: HDLC/LAPB, X.25, frame relay; WAN interfaces: V.35, X.21, RS422/449	None	Motorola 68000	10	IP, XNS, IPX/SPX, DECnet, AppleTalk	RIP	None	No	SNMP	NA	NA	1,000	IEEE 802.1D with Spanning Tree, IBM Source Routing	$5,500 - $7,000, depending on hardware configuration
	ACS 2100	Small	Ethernet: 2 802.5 10Base-5, 10Base-2	None	None	Intel 80386	16	IP, XNS, IPX/SPX, DECnet	RIP	None	No	SNMP	NA	NA	12,500	IEEE 802.1D with Spanning Tree	$3,250
Access Thruplex, Inc. (310) 989-4600 (800) 754-8836	Tiny/LAN 100 Router-Bridge	Medium	Ethernet: 12 maximum 802.3; Token Ring: 6 maximum 802.5; FDDI: 3 maximum ANSI X3T9.5; T1: 12 maximum	Ethernet: 12 maximum 802.3; Token Ring: Ethernet II6 maximum 802.5; FDDI: 3 maximum ANSI X3T9.5; T1: 12 maximum	None	Intel 80386	33	IP, XNS, IPX/SPX	RIP, OSPF, IPX RIP, IPX SAP, IPX remote RIP, IPX remote SAP, XNS RIP	SDLC, 4M/16M bit/sec. Token Ring	Yes	SNMP	528M bit/sec.	One channel	14,000	IEEE 802.1D with Spanning Tree, IBM Source Routing	$7,995 - $53,500, depending on LAN support
Cactus Computer, Inc. (214) 416-0528	Broadbalk to Ethernet Gateway	Small	Ethernet: 802.3; 802.7 broadband	None	2M bit/sec. operation over broadband	Motorola 68000	16	DECnet, AFP	RTMP	None	Yes	SNMP	20 MHz	One channel	4,000	IEEE 802.1D with Spanning Tree	$3,550
	Broadbalk to Gateway Lanbalk	Small	802.7 broadband	None	2M bit/sec. operation over broadband	Motorola 68000	16	DECnet, AFP	RTMP	None	Yes	SNMP	20 MHz	One channel	4,000	IEEE 802.1D with Spanning Tree	$2,800
Chipcom Corp. (508) 460-8900	Online Ethernet Router Module	Small	Ethernet: 2 802.5 Ethernet V2.0, 2 Ethernet LANs; T1 (optional) Ethernet serial version supports WAN links at T1/E1 rates	Ethernet: 1,2 802.3, depending on model, high-speed serial RS-232, RS-449, X.21, V.35	Depends on cable ordered	Motorola	16	IP, XNS, IPX, Banyan Vines, DECnet, XNS, AppleTalk, PUP, ChaosNet (all includes in base price)	RIP, IGRP, IS-IS, RTMP, BGP, EGP	NA	Yes	SNMP	NA	NA	7,000	IEEE 802.1D with Spanning Tree	$6,350 (Ethernet - Ethernet bridge router module), $6,850 (Ethernet serial bridge/router module), $7,150 (Ethernet serial plus X.25, frame relay router module)
Cisco Systems, Inc. (415) 326-1941	AGS+	Large	Ethernet: 1, 2 802.3; Token Ring: 4M/16M bit/sec.; FDDI, T1	Ethernet: 1, 2; Token Ring: 4M/16M bit/sec., FDDI; T1	None	Motorola 68040	30	IP, XNS, IPX, Vines, DECnet, AppleTalk, 3Com, UB Net One, Apollo Domain, Xerox PUP, ChaosNet, HP Advantagenet	RIP, IGRP, OSPF, IS-IS, BGP, EGP, ES-IS, IS-IS, RTMP	SDLC, 4M/16M bit/sec. Token Ring	Yes	SNMP, NetView, LAN' Network Manager	533	One channel	65,000	IEEE 802.1D with Spanning Tree, IBM Source Routing	$11,425 includes modular router system, processor card, memory card, router operating firmware, power supply, manual installation guide, console parts
	MGS	Medium	Ethernet: 2 802.3; Token Ring: 4M/16M bit/sec.	RS232, RS449, V.35, X.21, DTE	None	Motorola 68040	30	IP, XNS, IPX/SPX, Vines, DECnet, AppleTalk, 3Com, UB Net One, Apollo Domain, Xerox, PUP, ChaosNet, HP Advancement	RIP, IGRP, OSPF, IS-IS, BGP, EGP, IS-IS, RTMP	SDLC, 4M/16M bit/sec. Token Ring	Yes	SNMP, NetView	NP	NP	10,000	IEEE 802.1D with Spanning Tree, IBM Source Routing	$9,275 (modular router system)
	CGS	Small	Ethernet: 1, 2 802.3; Token Ring: 4M/16M bit/sec.	Ethernet: 1, 2 802.3; Token Ring: 4M/16M bit/sec.	None	Motorola 68040	30	IP, XNS, Vines, DECnet, Apollo Domain, Xerox, PUP, ChaosNet, HP Advancement, Novell IPX, AppleTalk, 3Com, UB Net One	RIP, IGRP, OSPF, IS-IS	SDLC, 4M/16M bit/sec. Token Ring	Yes	SNMP, NetView	NP	NP	20,000	IEEE 802.1D with Spanning Tree, IBM Source Routing	$5,425 includes modular router system, processor card, memory card, router operating firmware, power supply, manual, installation guide, console parts
	IGS/L, IGS/R, IGS/TR	Small	Ethernet: 2 802.3 (IGS/L, IGS/R); Token Ring: 4M/16M bit/sec. (IGS/TR); serial (IGS/R, IGS/TR)	NP	None	Motorola 68020	30	IP, XNS, Vines, DECnet	RIP, IGRP, OSPF, IS-IS, BGP, EGP, ES-IS, IS-IS, RTMP	SDLC, 4M/16M bit/sec. Token Ring	Yes	SNMP, NetView	NP	NP	7,000	IEEE 802.1D with Spanning Tree, IBM Source Routing	$6,995 (IGS/TR), $5,495 (IGS/R), $4,995 (IGS/L)

*Small chassis: Fixed configuration, with one or two slots; Medium: Modular with approximately four slots; Large: Modular with 8, 12 or more slots.

General DataComm, Inc. resells CrossComm's ILAN Universal Router as LAN*TMS. General DataComm can be reached at (203) 574-1118.

Digital Equipment Corp. will begin shipping the Network Integration Server 600 Bridge Router later this year.

The companies included in this chart responded to a recent survey conducted by *Computerworld*. When a vendor is unable to provide specific information about its product, the abbreviation NP (not provided) is used. When a question does not apply to a vendor's product, the abbreviation NA (not applicable) is used. Contact vendor for further product information.

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standards for Frame Relay and the DXI standard for SMDS. Indeed, we've been a driving force in standards development. For the Wellfleet Wide-Area Internetworking Report, call **1-800-448-3400, ext. 488W.** It will give you a more complete picture.

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VENDOR	PRODUCT	CHASSIS SIZE*	INTERFACES SUPPORTED (LOCAL)	INTERFACES SUPPORTED (REMOTE)	LAN LIMITATIONS	PROCESSOR TYPE	PROCESSOR SPEED (MHZ)	ROUTABLE PROTOCOLS SUPPORTED	INTER-ROUTER PROTOCOLS SUPPORTED	SNA FEATURES SUPPORTED	TELNET SUPPORT	NETWORK MANAGEMENT SUPPORTED	BACKPLANE SPEED	BACKPLANE USED TO DETERMINE SPEED	MAXIMUM THROUGHPUT (PACKET/SEC.)	BRIDGING OPTIONS	BASE PRICE
CisorPoint Research Corp. (508) 435-2000	Little Dipper	Large	Ethernet: 6 10Base-2, 10Base-6 Version 2; MAU Port	2 wide-area ports 9.6K - 384K bit/sec., X.25, frame relay	System support up to 6 Ethernet plus 2 wide-area ports	AMD 29000 (RISC)	20	IP, XNS, IPX/SPX	RIP	None	Yes	SNMP, Integral ASCII window-based system	160M bit/sec.	Multiple channel	12,000	IEEE 802.1D with Spanning Tree	$7,495 includes 1 chassis, power supply, SNMP, bridging, S/W plus routing S/W, 2 WAN ports
	Pyxis	Small	Ethernet: 4 Version 2, AUI, BNC	1 wide-area port 9.6K - 256K bit/sec.	Unit can be purchased with either 4 BNC or AUI connectors	AMD 29000 (RISC)	16	IP, XNS, IPX/SPX	RIP	None	Yes	SNMP, Integral ASCII window-based system	120M bit/sec.	Multiple channel	8,000	IEEE 802.1D with Spanning Tree	$6,995 includes 4 local and 1 remote port, 1M byte of memory, routing, management, bridging S/W
	Carina	Small	Ethernet: 4 Version 2, AUI, BNC	1 wide-area port 9.6K - 256K bit/sec.	Unit can be purchased with either 4 BNC or AUI connectors	AMD 29000 (RISC)	16	IP, XNS, IPX/SPX	RIP	None	Yes	SNMP, Integral ASCII window-based system	120M bit/sec.	Multiple channel	8,000	IEEE 802.1D with Spanning Tree	$6,995 includes 4 local and 1 remote port, 1M byte of memory, routing, management, bridging S/W in single 6U VME module
	Aurigo	Small	Ethernet: 4 Version 2, AUI, BNC	1 wide-area port 9.6K - 256K bit/sec.	Unit can be purchased with either 4 BNC or AUI connectors	AMD 29000 (RISC)	16	IP, XNS, IPX/SPX	RIP	None	Yes	SNMP, Integral ASCII window-based system	120M bit/sec.	Multiple channel	8,000	IEEE 802.1D with Spanning Tree	$4,995 includes 4 local and 1 remote port, 1M byte of memory, routing, management, bridging S/W in single EISA/ISA module
Cisco Network Corp. (508) 480-8010	Broadband Enterprise switch (Model CX 1000)	Large	Ethernet: 20 maximum 802.3, Ethernet 2.0 (AUI, BNC); Token Ring: 20 maximum 802.5 (4M/16M bit/sec.); FDDI: 3 maximum; T1: 20 maximum; E1: 20 maximum	Ethernet: 20 maximum 802.3; Ethernet 2.0 (AUI, BNC); Token Ring: 20 maximum 802.5 (4M/16M bit/sec.); FDDI: 3 maximum; T1: 20 maximum; E1: 20 maximum	Card slots, bus bandwidth, number of queues serviced by switch, network type	Intel 80960	33	IP, IPX/SPX, DECnet, AppleTalk II	RIP, OSPF, EGP, BGP	4M/16M bit/sec. Token Ring	Yes	SNMP	800M bit/sec.	Multiple channel, nonblocking design	400,000 (bridge filtering, forwarding), 25,000+ (IP routing)	IEEE 802.1D with Spanning Tree, IBM Source Routing	$21,200 includes high-performance bridge with two Ethernet interfaces
CrossComm Corp. (508) 481-4000	Bus Universal Router	Medium	Ethernet: 4 802.3 UTP, STP, AUI; Token Ring: 4 802.5 UTP, STP; T1.5	6 serial WAN interfaces	None	Intel 80386	33	IP, IPX/SPX, SNA, NetBIOS	RIP, SPF	3270 coaxial, SDLC, 4M/16M bit/sec. Token Ring	No	SNMP, IBM LAN Network Manager	NP	One channel	NP	IEEE 802.1D with Spanning Tree, IBM Source Routing	$6,000 - $13,000, depending on interfaces supported
Frontier Technologies (414) 241-4555	Super-DDN Bridge for NetWare	Small	Ethernet: 1 802.3; X.25	Ethernet: 1 802.3; X.25	None	Intel 80286	10	IPX/SPX, Vines	None	None	Yes	SNMP	10 MHz	Multiple channel	NP	IBM Source Routing	$6,995 includes software, adapter
Cambell Systems Corp. (800) 626-8100	Infotron 2130	Small	Ethernet: 2 Ethernet II, 802.3; Token Ring: 4M/16M bit/sec.; T1.1, FT1, frame relay	Ethernet: 2 Ethernet II, 802.3; Token Ring: 4M/16M bit/sec.; T1: 1; FT1, frame relay	Does not support Ethernet and Token Ring simultaneously	Motorola 68302	16	IP, XNS, IPX/SPX, DECnet, AppleTalk D	RIP, OSPF, BGP	4M/16M bit/sec. Token Ring	Yes	SNMP, remote supervisory console	NA	NA	800	IEEE 802.1D with Spanning Tree, IBM Source Routing	$6,000 includes base unit, software, router
	Access Router	Small	Ethernet: 2 Ethernet II, 802.3, 802.1D; Token Ring: 4M/16M bit/sec.; T1: 2	Ethernet: 2 Ethernet II, 802.3, 802.1D; Token Ring: 4M/16M bit/sec.; T1: 2	NP	Intel 80386	25	IP, XNS, IPX/SPX, DECnet, Vines IP	RIP, OSPF, ES-IS	4M/16M bit/sec. Token Ring	Yes	SNMP	NA	NA	7,000	IEEE 802.1D with Spanning Tree, IBM Source Routing	$6,200 includes software
	Infotron 4000 series	Medium	Ethernet: 2 Ethernet II, 802.3, 802.1D; Token Ring: 4M/16M bit/sec.; T1: 2; X.25 frame relay, FT1, HDLC	Ethernet: 2 Ethernet II, 802.3, 802.1D; Token Ring: 4M/16M bit/sec.; T1: 2; X.25 frame relay, FT1, HDLC	NP	Motorola 68020	25	IP, XNS, IPX/SPX, DECnet, AppleTalk	RIP, OSPF, EGP	4M/16M bit/sec. Token Ring	Yes	SNMP	NA	NA	5,000	IEEE 802.1D with Spanning Tree, IBM Source Routing	$5,500 includes 2 WAN interfaces, 1 LAN interface
Hewlett-Packard Co. (800) 752-0900	HP router CR	Medium	Ethernet: 8 802.3; Token Ring: 4 802.5 4M/16M bit/sec.; T1: 16	Ethernet: 8 802.3; Token Ring: 4 802.5 4M/16M bit/sec.; T1: 16	4 slots maximum, 2 E Card, 2E2T1 card, 2 TR card	Motorola multiple 68030	25	IP, XNS, IPX/SPX, DECnet, AFP	RIP, OSPF	SDLC, 4M/16M bit/sec. Token Ring	Yes	SNMP	640M bit/sec.	Multiple channel	14,000	IEEE 802.1D with Spanning Tree, IBM Source Routing	$13,000 for 2E configuration
	HP router TR	Small	Ethernet: 1 802.3, Token Ring: 1 802.5 4M/16M bit/sec.; T1: 2 (not local connection)	Ethernet: 1; Token Ring: 1; T1: 2	NA	Motorola 68030	25	IP, XNS, IPX/SPX, DECnet, AFP	RIP, OSPF	4M/16M bit/sec. Token Ring	Yes	SNMP	400 byte/sec.	Multiple channel	5,500 Ethernet to Token Ring	IEEE 802.1D with Spanning Tree, IBM Source Routing	$8,500 for all 4 links, protocols
	HP router ER	Small	Ethernet: 2 (Version 1, 2)	Ethernet: 2 (Version 1, 2); T1: 2	NA	Motorola 68030	25	IP, XNS, IPX/SPX, DECnet, AFP	RIP, OSPF	NP	Yes	SNMP	400 byte/sec.	Multiple channel	11,000	IEEE 802.1D with Spanning Tree	$8,000 for all 4 links, protocols
Bagnet Network Systems (201) 801-4000	LANswitch	Small	Ethernet: 4 IEEE/Ethernet, AUI/10Base-T selectable	Ethernet: 4 IEEE/Ethernet, AUI/10Base-T selectable	NP	Intel 960	33	IP, IPX/SPX	RIP, frame relay	NP	Yes	SNMP, FTP s/w download	33-MHz, 32-bit parallel bus	One channel	14,000	IEE 802 1D with Spanning Tree	$7,000 includes 2 Ethernet, 1 frame-relay port with IP, IPX, 802 1D bridging; $9 000 includes 4 Ethernet, 2 frame-relay ports with IP, IPX, 802 1D bridging
Microcom, Inc. (617) 351-1000 (800) 822-8224	Micron Bridge/ Router	Small	Ethernet: 2 802.3; Token Ring: 4 4M/16M bit/sec.	Ethernet: 4 802.3; Token Ring: 4 4M/16M bit/sec.; FDDI: 4 class A links (DAS); T1: 28 ports; 4 ports DS-3 (45M bit/sec.)	NP	Motorola 68000	25	IP, TCP/IP	RIP	4M/16M bit/sec. Token Ring	No	SNMP	4,000	Multiple channel	1,400	IEEE 802.1D with Spanning Tree, IBM Source Routing	$3,999 - $7,999 includes software and selection of add-on boards for LAN or WAN interfaces
NCR Corp. (800) 225-5627	StarWAN Bruster Model 450	Large	Ethernet: 28 802.3 Version 1, 2; Token Ring: 7 4M/16M bit/sec.; FDDI: 4 class A links (DAS); T1: 28 ports; 4 ports DS-3 (45M bit/sec.)	Ethernet: 28 ports 802.3 Version 1, 2; Token Ring: 7 ports 4M/16M bit/sec.; FDDI: 4 class A links (DAS); T1: 28 ports; 4 ports DS-3 (45M bit/sec.)	Capacitors not achievable simultaneously	Motorola 68040	30	IP, XNS, IPX/SPX, Vines, DECnet, AFP, 3Com 3+Open, UB Net One, Apollo Domain, PUP, ChaosNet, HP Advancenet	RIP, IGRP, OSPF IS-IS, BGP, EGP, ES-IS, RTMP	SDLC, 4M/16M bit/sec. Token Ring	Yes	SNMP, NetView	533M bit/sec.	Multiple channel	65,000	IEEE 802 1D with Spanning Tree, IBM Source Routing	$12,915 includes modular router chassis, processor card, memory card, operating software, power supply, administration and installation guides and console port

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AT&T MEGACOM WATS OUTBOUND LONG DISTANCE SERVICE

VENDOR	PRODUCT	CHASSIS SIZE*	INTERFACES SUPPORTED (LOCAL)	INTERFACES SUPPORTED (REMOTE)	LAN LIMITATIONS	PROCESSOR TYPE	PROCESSOR SPEED (MHZ)	ROUTABLE PROTOCOLS SUPPORTED	INTER-ROUTER PROTOCOLS SUPPORTED	SNA FEATURES SUPPORTED	TELNET SUPPORT	NETWORK MANAGEMENT SUPPORTED	BACKPLANE SPEED	BACKPLANE USED TO DETERMINE SPEED	MAXIMUM THROUGHPUT (PACKET/SEC.)	BRIDGING OPTIONS	BASE PRICE
NCR (cont.)	StarWAN Remote Model 400	Medium	Ethernet: 2 802.3 Version 1, 2; Token Ring: 4 4M/16M bit/sec.; T1: 16	Ethernet: 8 802.3 Version 1, 2; Token Ring: 4 4M/16M bit/sec.; T1: 16 ports	Capacities not achievable simultaneously	Motorola 68040	30	IP, XNS, IPX/SPX, Vines, DECnet, AFP, 3+Open, UB Net One, Apollo Domain, PUP, ChaosNet, HP Advancenet	RIP, IGRP, OSPF, IS-IS, BGP, EGP, ES-IS, RTMP	SDLC, 4M/16M bit/sec. Token Ring	Yes	SNMP, NetView, LAN Network Manager	NP	One channel	20,000	IEEE 802.1D with Spanning Tree, IBM Source Routing	$11,800 includes modular router chassis, processor card, memory card, operating software, power supply, administration, installation guides and console port
	StarWAN Remote Model 100 Remote	Small	Ethernet: 1 802.3 Version 1, 2; T1: 1 port	NA	Capacities not achievable simultaneously	Motorola 68040	NP	IP, XNS, IPX/SPX, Vines, DECnet, AFP, 3+Open, UB Net One, Apollo Domain, PUP, ChaosNet, HP Advancenet	RIP, IGRP, OSPF, IS-IS, BGP, EGP, ES-IS, RTMP	NP	Yes	SNMP, NetView	NP	One channel	7,000	IEEE 802.1D with Spanning Tree	$5,776 includes non-modular router chassis with Ethernet connections, processor card, memory card, operating software, power supply, administration, installation guides and console port
	StarWAN Bridge Model 200	Small	Ethernet: 2 802.5 Version 1, 2; T1: 2 port	Ethernet: 2 802.3 Version 1, 2; T1: 2 port	Capacities not achievable simultaneously	Motorola 68040	30	IP, XNS, IPX/SPX, Vines, DECnet, AFP, 3+Open, UB Net One, Apollo Domain, PUP, ChaosNet, HP Advancenet	RIP, IGRP, OSPF, IS-IS, BGP, EGP, OSI ES-IS, RTMP	SDLC	Yes	SNMP, NetView, LAN Network Manager	NP	One channel	20,000	IEEE 802.1D with Spanning Tree	$5,696 includes modular router chassis, processor card, memory card, operating software, power supply, administration, installation guides and console port
	StarWAN Remote Model 195 Local	Small	Ethernet: 2 802.5 Version 1, 2	NA	Capacities not achievable simultaneously	Motorola 68020	NP	IP, XNS, IPX/SPX, Vines, DECnet, AFP, 3+Open, UB Net One, Apollo Domain, PUP, ChaosNet, HP Advancenet	RIP, IGRP, OSPF, IS-IS, BGP, EGP, ES-IS, RTMP	NP	Yes	SNMP, NetView, LAN Network Manager	NP	One channel	7,000	IEEE 802.1D with Spanning Tree	$5,245 includes non-modular router chassis with Ethernet connections, processor card, memory card, operating software, power supply, administration, installation guides and console port
Network Resources Corp. (408) 263-8000	Multigate Hub 2	Medium	Ethernet: 2 802.3, 10Base-T, 10Base-F, 10Base-2, 10Base-3	T1: 2 lines: 1 56K bit/sec. line additional	Ethernet port pre-configured, one Ethernet port as backplane port, other has 24 10Base-T ports	Motorola 68030	25	IP, AppleTalk	RIP, RTMP	NP	Yes	SNMP	100M bit/sec.	One channel	15,000	IEEE 802.1D with Spanning Tree	$5,995 includes 24-port 10Base-T intelligent hub, backbone Ethernet port, bridging with Spanning Tree support, SNMP network management software
Plexcom, Inc. (800) 832-3233	8029-5 Plex-Router	NP	Ethernet: Mac Local 802.3	NP	None	Intel 80386	16	IP, IPX/SPX	RIP	NP	Yes	SNMP	4 MHz, 16 MHz	Multiple channel	2,500	IEEE 802.1D with Spanning Tree	NP
Proteon, Inc. (508) 898-2800	CNX 600 Bridging Router	Medium	Ethernet: 6 802.3; Token Ring: 6 802.5 4M/16M bit/sec.; FDDI: 3; ProNet-10	Ethernet: 6 802.3; Token Ring: 6 802.5 4M/16M bit/sec.; FDDI: 6; T1: 6	None	RISC 96000	25	IP, XNS, IPX/SPX, Vines, DECnet, AFP	RIP, OSPF, IS-IS	3270 coaxial, SDLC, 4M/16M bit/sec. Token Ring	Yes	SNMP, NetView, DECmcc	800M bit/sec.	One channel	3,000	IEEE 802.1D with Spanning Tree, IBM Source Routing, Adaptive Source Route Transparent	$7,999
	P4100+ Bridging Router	Medium	Ethernet: 3 802.3; Token Ring: 3 802.5 4M/16M bit/sec.; ProNet-10	Ethernet: 2 802.3; Token Ring: 2 802.5 4M/16M bit/sec.; T1: 7	None	Intel 80386	20	IP, XNS, IPX/SPX, Vines, DECnet, AFP	RIP, OSPF, IS-IS	3270 coaxial, SDLC, 4M/16M bit/sec. Token Ring	Yes	SNMP, Net view	AT bus	One channel	3,000	IEEE 802.1D with Spanning Tree, IBM Source Routing, Adaptive Source Route Transparent	$5,495 includes IP protocol
RAD Network Devices, Inc. (714) 891-1446	Open Gate	Medium, large	Ethernet: 802.3 Version 2; Token Ring: 802.5 4M/16M bit/sec.; FDDI; X3T9.5; T1	Ethernet: 802.3 Version 2; Token Ring: 802.5 4M/16M bit/sec.; FDDI, X3T9.5, T1	None	Intel 80960 (RISC)	25 - 100	IP, XNS, IPX/SPX, DECnet, AppleTalk	RIP, OSPF, IS-IS, Dynamic SPF	SDLC, 4M/16M bit/sec. Token Ring	Yes	SNMP, NetView	640M bit/sec.	One channel	450,000	IEEE 802.1D with Spanning Tree, IBM Source Routing, SRT	$1,800 - $80,000, depending on number of modules
Retix (310) 828-3000	4982 Remote Bridge-Router	NP	Ethernet: 1 802.3	2 RS232, X.21, V.35, RS449, G.703, T1	NP	Motorola 68020, 68030	NP	IP, IPX/SPX, DECnet	RIP	NA	Yes	SNMP, MAP/TCP, CMIP	NA	NA	8,000	IEEE 802.1D with Spanning Tree	$7,990
	4942 Remote Bridge-Router	NP	Ethernet: 1 802.3	2 RS232, X.21, V.35, RS449, G.703, T1	NP	Motorola 68020	NP	IP, IPX/SPX, DECnet	RIP	NA	Yes	SNMP, MAP/TCP, CMIP	NA	NA	8,000	IEEE 802.1D with Spanning Tree	$6,990
	4941 Remote Bridge-Router	NP	Ethernet: 1 802.3	2 RS232, X.21, V.35, RS449, G.703, T1	NP	Motorola 68020	NP	IP, IPX/SPX, DECnet	RIP	NA	Yes	SNMP, MAP/TCP, CMIP	NA	NA	8,000	IEEE 802.1D with Spanning Tree	$4,950
	4700 Remote Bridge-Router	Small	Ethernet: 1 802.3	2 RS232, X.21, V.35, RS449, G.703, T1	NP	Motorola 68020	NP	IP	RIP	NA	Yes	SNMP, MAP/TCP, CMIP	NP	NA	NA	IEEE 802.1D with Spanning Tree	$4,250

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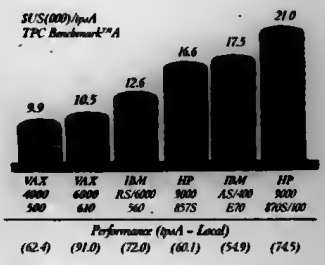

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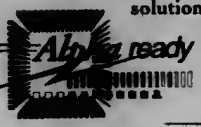

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3Com Corp. (408) 764-5000	NetBuilder	Medium	Ethernet: 2 802.3	Ethernet: 2 802.3; T1: 2	None	Motorola 68030	30	TCP/IP, IPX, DECnet Ph. IV, OSI	RIP, OSPF, IS-IS, ES-IS, EGP	4M/16M bit/sec. Token Ring	Yes	SNMP	NA	Our channel	6,400	IEEE 802.1D with Spanning Tree	$4,745 - $5,145 (next hardware); $7,245 - $7,445 (remote hardware); $250 (bridge software); $750 (bridge/router software); $1,500 (bridge/router with wide-area services software)
	NetBuilder Token Ring	Medium	Token Ring: 4M/16M bit/sec.	Token Ring: 4M/16M bit/sec.; T1: 2 V.35, RS449, RS232 interfaces	Maximum 2 LAN and 2 WAN ports fully configurable	Motorola 68030	16	TCP/IP, IPX, DECnet Ph. IV, AppleTalk Ph. II, XNA, OSI, Vines	RIP, OSPF, EGP, IS-IS, ES-IS, BGP	4M/16M bit/sec.	Yes	SNMP	NA	Our channel	NA	IEEE 802.1D with Spanning Tree, IBM Source Router, 802.3 SRT	$7,450 includes software protocols (local), $12,000 includes software protocols (remote)
	NetBuilder II	Large	Ethernet: 6 802.3, Version 2; FDDI: 2; T1: 8	Ethernet: 6 802.3, Version 2; FDDI: 2; T1: 8	6 slots maximum; FDDI takes 2 slots	AMD 29K (RISC)	25	IP, XNS, IPX, DECnet Ph. IV, AppleTalk Ph. II, OSI	RIP, OSPF, EGP, IS-IS, ES-IS, EGP	4M/16M bit/sec. Token Ring	Yes	SNMP	800M bit/sec.	Our channel	50,000	IEEE 802.1D with Spanning Tree, IBM Source Routing, SRT	$10,245 includes 4-slot chassis, main processor, 2 Ethernet modules
Ungermann-Bass, Inc. (408) 496-0111	Access/One Remote Bridge/Router	Small, medium, large	Ethernet: 1 - 11; Token Ring: 1 - 20; T1: 1 - 16	Ethernet: 1 - 11; Token Ring: 1 - 20; T1: 1 - 20	NP	Motorola	25	IP, XNS, IPX/SPX, DECnet, AppleTalk, ARP	RIP, OSPF	16M bit/sec. Token Ring	No	SNMP	10M bit/sec.	Our channel	4,300	IEEE 802.1D with Spanning Tree, IBM Source Routing	$10,990 (ASM 8510 2 Token Ring, 1 serial); $6,990 (ASM 8310 2 Ethernet, 1 serial); $10,489 (ASM 8520 1 Token Ring, 2 serial); $7,990 (ASM 8500 1 Token Ring, 1 serial); $7,940 (ASM 8320 1 Ethernet, 2 serial); all include router and all necessary software
Vitalink Communications Corp. (510) 794-1100	TransPath	Small	Ethernet: 1 802.3, Ethernet Version 2; Token Ring: 4M/16M bit/sec.; T1: 2 ports	Ethernet: 1 802.3, Ethernet Version 2; Token Ring: 4M/16M bit/sec.; T1: 2 ports	NP	NP	NP	IP, XNS, IPX	RIP-, SPF-based IGP	4M/16M bit/sec. Token Ring	Yes	SNMP, DECmcc	NP	Multiple Channel	3,000	IEEE 802.1D with Spanning Tree	$13,500 includes hardware and software
	6000 Bridge-Router	Small	Ethernet: 2, 4 802.3, Ethernet Version 2; FDDI: 1 at 50 Micron, 62.5 Micron; T1: 1, 2 or 4 ports	Ethernet: 2, 3 802.3, Ethernet Version 2; FDDI: 1 at 50 Micron, 62.5 Micron; T1: 1, 2 or 4 ports	NP	AMD 2900 (RISC)	25	IP, XNS, IPX/SPX, DECnet	RIP, OSPF	NP	Yes	SNMP	400M bit/sec.	Multiple Channel	30,000	IEEE 802.1D with Spanning Tree	$6,950 includes hardware and software
	6400, 6800 Bridge-Router	Medium, large	Ethernet: 12, 16 (6400) 16 (6800) 802.3, Ethernet Version 2; FDDI: 50+ 62.5 micron 2 ports (6400) 3 port (6800); T1: 12, 16 ports (6400), 24 ports (6800)	Ethernet: 12, 16 (6400) 16 (6800) 802.3, Ethernet Version 2, FDDI: 50+ 62.5 micron 2 ports (6400) 3 port (6800); T1: 12, 16 ports (6400), 24 ports (6800)	Configuration limited by bandwidth of applications	AMD 29K (RISC)	25	IP, XNS, IPX/SPX, DECnet	RIP, OSPF	Channel attach	Yes	SNMP	400M bit/sec. (6400), 800M bit/sec. (6800)	Multiple Channel	NP	IEEE 802.1D with Spanning Tree	$17,500 base price includes hardware, software (6400); $24,500 base price includes hardware, software (6800)
WellFleet Communications, Inc. (617) 275-2400	Feeder Node	Small	Ethernet: 2 802.3; Token Ring: 1 802.5; T1: 2	Ethernet: 2 802.3; Token Ring: 1 802.5; T1: 2	None	Motorola	32	IP, XNS, IPX/SPX, Vines, DECnet, AppleTalk	RIP, OSPF, IS-IS	SDLC, 4M/16M bit/sec. Token Ring	Yes	SNMP, NetView, DECmcc	320	Multiple channel	14,500	IEEE 802.1D with Spanning Tree, IBM Source Routing	$6,995 starting price
	Link Node	Large	Ethernet: 16; Token Ring: 8; T1: 16 synchronous ports	Ethernet: 16; Token Ring: 8; T1: 16 synchronous ports	None	Motorola	32	IP, XNS, IPX/SPX, DECnet, AppleTalk	RIP, OSPF, IS-IS	SDLC, 4M/16M bit/sec. Token Ring	Yes	SNMP, NetView, DECmcc	320	Multiple channel	58,000	IEEE 802.1D with Spanning Tree, IBM Source Routing	$8,495 starting price
	Concentrator Node	Large	Ethernet: 52; Token Ring: 26; T1: 52 synchronous ports	Ethernet: 52; Token Ring: 26; T1: 52 synchronous ports	None	Motorola	32	IP, XNS, IPX/SPX, DECnet, AppleTalk	RIP, OSPF, IS-IS	SDLC, 4M/16M bit/sec. Token Ring	Yes	SNMP, NetView, DECmcc	320	Multiple channel	188,000	IEEE 802.1D with Spanning Tree, IBM Source Routing	$16,000 starting price
Xyplex, Inc. (800) 344-9000	6210 Remote Router	Small	Ethernet: 1 802.3	Ethernet: 2 802.3	NP	Motorola 68020	30	IP, IPX/SPX, DECnet	RIP, OSPF, SAP, EGP	None	Yes	SNMP, NetView	NA	NP	1,700	IEEE 802.3 with Spanning Tree	$4,429 includes hardware
	6710 Remote Router Card	Large	Ethernet: 1 802.3	Ethernet: 1 802.3 per card	This is card for Xyplex chassis, which supports 10Base-T hubs, terminal servers, bridges, routers, gateways	Motorola 68020	16	IP, IPX/SPX, DECnet	RIP, OSPF, SAP, EGP, RIP-IPX	NP	Yes	SNMP, NetView	10M bit/sec.	Our channel	2,500	IEEE 802.3 with Spanning Tree	$3,495 includes hardware card (not including chassis)
	3710 Local Router Card	Large	Ethernet: 2 802.3, 1 via internal bus of Xyplex chassis	Ethernet: 1 802.3	This is card for Xyplex chassis, which supports 10Base-T hubs, terminal servers, bridges, routers	Motorola 68020	16	IP, IPX/SPX, DECnet	RIP, OSPF, SAP, EGP, RIP-IPX	NP	Yes	SNMP, NetView	10M bit/sec.	Our channel	6,000	IEEE 802.31D with Spanning Tree	$2,995 includes hardware card (not including chassis)
	3210 Local Router	Small	Ethernet: 3 802.3	Ethernet: 1 802.3	NP	Motorola 68020	20	IP, IPX/SPX, DECnet	RIP, OSPF, SAP, EGP, RIP-IPX	NP	Yes	SNMP, NetView	NA	NP	6000	IEEE 802.31D with Spanning Tree	$2,695 includes hardware, stand-alone unit

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BUYERS' SCORECARD

Multiprotocol routers: 3Com nets top score

BY DEREK SLATER
CW STAFF

Routers are playing a starring role in one of the computer industry's main acts of the 1990s — the quest for true interoperability among different types of systems and networks.

Boston-based consultancy The Yankee Group pegs the 1991 multiprotocol router market at $442 million and speculates that figure will rise to $1.3 billion by 1995.

In this active arena, *Computerworld*'s Buyers' Scorecard on multiprotocol routers showed the market share leaders running a close race in user satisfaction. 3Com Corp. topped the charts with an overall score of 83, followed by Cisco Systems, Inc. (79) and Proteon, Inc. (77).

Total possible score	100
Mean score	78

The Buyers' Scorecard records user satisfaction with their installed technologies. Users assigned 1 to 10 ratings based on their satisfaction with their routers in 14 specific categories.

The users also rated the relative importance of each category (see methodology next page for a complete description of the scoring process).

3Com earned the mailman award: Users say 3Com's routers deliver nearly every time. The company's entries topped the reliability category by a wide margin (9.2, compared to Cisco's 8.3). Users rated reliability as the most critical ratings area (user importance rating: 9.4). 3Com also took the highest honors in the second- and third-most important categories, responsiveness of vendor service and performance.

3Com's lowest rating was in the area of support for integrating local-area networks with IBM protocols such as Systems Network Architecture (SNA) and NetBIOS (6.6).

3Com users reported predominantly using the firm's NetBuilder 2000 router but also other models.

Cisco, finishing in second place with an overall mark of 79, earned the highest score in two of the 13 categories. Notable scores came in support for multiple LAN protocols (8.7, compared to Proteon's 7.9) and physical connectivity to the LAN (8.6). Areas where Cisco suffered relatively low ratings included value for the dollar (third place, 7.1).

Cisco dominates the current market in installed base, offering a variety of multiprotocol models. Most of the users surveyed used Cisco's AGS and AGS+ models, which are based on the Motorola, Inc. 68040 processor. Users with less sophisticated IGS and CGS models also responded.

Proteon stayed close to its competitors, finishing two points behind Cisco overall, despite earning a clear first-place rating in only one evaluation area: support for integrating LANs with SNA and NetBIOS (7.9). Proteon also scored well in physical connectivity to the LAN (8.2) and support for industry-standard LAN routing protocols (8.0).

Proteon's response base included users of the CNX 500, a reduced instruction set computing-based bridge/router, and Intel Corp. processor-based p4100+ and p4200+ routers.

Users' ratings in response to a separate question asking their satisfaction with their routers yielded results that mirrored the overall order of finish. 3Com finished first with an 8.4, followed by Cisco at 7.9 and Proteon at 7.3.

Multiprotocol routers

Total scores reflect average user ratings for all measured areas, weighted by user-assigned importance. Response base: Proteon and Cisco: 30; 3Com: 20.

Product vendor	Highest ratings	Lowest ratings
3Com SCORE 83	Reliability Performance Support for industry-standard LAN protocols	Integrating LANs with SNA, NetBIOS Flexibility of architecture Support for multiple LAN protocols
Cisco SCORE 79	Support for multiple LAN protocols Physical connectivity to the LAN Reliability	Integrating LANs with SNA, NetBIOS Physical design Value for the dollar
Proteon SCORE 77	Value for the dollar Physical connectivity to the LAN Support for standard LAN routing protocols	Ease of installation and configuration Flexibility of architecture Quality of vendor support

Wellfleet Communications, Inc., which was not included in the main Buyers' Scorecard report because of an insufficient number of respondents, earned an 8.0 average rating on the overall satisfaction question (see chart on next page for details of Wellfleet's ratings).

Users cited key benefits of using multiprotocol routers including control of the network, wide-area network accessibility, diverse protocol support, better routing capabilities, high performance and network segmentation.

Features that are high on users' list of demands for improving multiprotocol routers included the following: continued improvement of network management capabilities, more consistent configuration commands, more ports, improved connectivity and compatibility and more automation (for example, several users requested self-booting capability for their routers).

Although support for LAN/SNA integration ranked as the least important evaluation category, nearly half of all respondents reported that they are integrating personal computer LANs with IBM SNA networks. ●

RATINGS IN ORDER OF IMPORTANCE

3Com's multiprotocol routers sweep the key ratings, with Cisco's products taking second place in five of the six areas users say are most important.

(Additional ratings on next page)

User importance rating:

9.4 Reliability

3Com	9.2
Cisco	8.3
Proteon	7.8

8.7 Responsiveness of vendor service

3Com	8.6
Cisco	7.5
Proteon	7.3

8.6 Performance

3Com	8.8
Cisco	8.2
Proteon	8.0

8.6 Quality of vendor support

3Com	8.0
Cisco	7.8
Proteon	7.3

8.4 Manageability; support for standard management protocols

3Com	8.0
Cisco	7.8
Proteon	7.7

8.4 Support for industry-standard LAN routing protocols

3Com	8.8
Proteon	8.0
Cisco	7.4

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RATINGS IN ORDER OF IMPORTANCE

(Multiprotocol routers, continued from previous page):

Cisco's routers score highest in two of the remaining areas, and Proteon tops one category

8.4 Value for the dollar

3Com	8.5
Proteon	8.2
Cisco	7.1

8.1 Support for WAN connectivity

3Com	8.6
Cisco	8.5
Proteon	8.0

8.1 Quality and quantity of support for multiple LAN protocols

Cisco	8.7
Proteon	7.9
3Com	7.5

8.1 Flexibility of architecture for upgrades and expansion

3Com	7.5
Cisco	7.4
Proteon	6.8

7.7 Physical connectivity to the LAN

Cisco	8.6
Proteon	8.2
3Com	7.9

7.5 Ease of installation and configuration

3Com	8.3
Cisco	7.6
Proteon	6.4

6.9 Physical design; ruggedness, footprint

3Com	8.2
Proteon	7.3
Cisco	7.0

6.0 Support for integrating LANs with SNA, NetBIOS

Proteon	7.9
Cisco	6.7
3Com	6.6

Verbatim

What do you like best/least about this product?
(Based on the most frequently stated answer. Quotes are selected from users' responses.)

3Com

Likes
Compliance with industry standards
"It's proven, has good LAN support and good SNA support."

Dislikes
Lack of flexibility
"It lacks flexible bridging."

Cisco

Likes
Handling of multiple protocols
"It allows us to easily route several protocols."

Dislikes
Poor hardware design
"If you have to repair it, it has to be taken apart completely."

Proteon

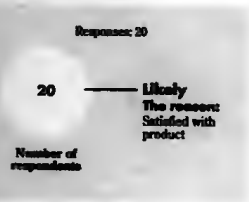
Likes
Reliability
"Its strength is that I don't have to worry about it."

Dislikes
Difficult to configure
"The user interface could be easier to set up."

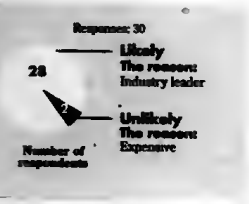
Loyalties

Would you buy the product again?
(Reasons based on most frequently stated responses)

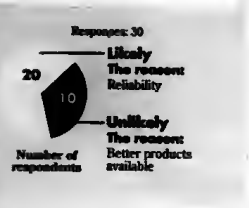
3Com



Cisco



Proteon



Vital statistics

Total number of respondents: 80

What is your position?

IS director	5
IS manager	8
Network manager	32
Support staff	21
Other	14

What is your responsibility for multiprotocol routers? (multiple responses)

Evaluate or recommend vendors	74
Determine need	73
Set standards for your company	68
Select vendors	66
Buy for end-user departments	44

How many multiprotocol routers do you have installed?

1-5	37
6-10	16
11-20	18
21-50	6
More than 50	3

How long have you been involved with multiprotocol routers?

Less than 1 year	7
1-2 years	18
3-4 years	26
More than 4 years	29

Wellfleet ratings

Wellfleet's routers earned appreciative marks from its users. Respondents using the company's high-end Concentrator Node and midsize Link Node rated the products high in key areas such as reliability and performance. Areas with lower user satisfaction included value for the dollar and service and support.

Reliability	8.9
Physical design	8.9
Physical connectivity to the LAN	8.5
Performance	8.4
Support for WAN connectivity	8.4
Flexibility of architecture	8.3
Support for industry-standard routing protocols	8.2
Manageability	8.0
Support for multiple LAN protocols	7.8
Ease of installation and configuration	7.8
Quality of vendor support	7.6
Value for the dollar	7.4
Responsiveness of vendor service	7.1
Integrating LANs with SNA, NetBIOS	6.9

METHODOLOGY

Products included in this Buyers' Scorecard are multiprotocol routers from the leading vendors in terms of market share. Market share in 1991, according to The Yankee Group, was as follows: Cisco Systems, Inc., 51%; 3Com Corp., 11%; Wellfleet Communications, Inc., 9%; Digital Equipment Corp., 7%; Proteon, Inc., 6%.

Wellfleet's results are reported separately because the number of survey respondents was below the Buyers' Scorecard minimum of 20. DEC is not included in the survey because its multiprotocol router began shipping only recently.

User names were provided by a combination of vendor and nonvendor sources. First Market Research in Austin, Texas, conducted the survey and tabulated the results.

To compute the overall score for each product, perform the following steps: 1) Multiply the product's score in the first category by the user importance rating for that category to obtain the weighted score. 2) Repeat the process for all ratings areas. 3) Average the resulting figures for the average weighted score. 4) Convert the average weighted score to base 100.

The ratio of the average weighted score to the average user importance rating equals the ratio of the overall score to 10. Numbers are rounded off where necessary.

ACKNOWLEDGMENTS

Computerworld thanks the following individual and company for assistance in preparing this Buyers' Scorecard: Todd Dagres, The Yankee Group.

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Women in charge

The move from IS chief to business executive is tough, even if you're a man. For women, it's been practically unheard of — until these three women.

BY CLINTON WILDER

The crossover from chief information officer to the top ranks of general business management continues to elude most information systems chiefs. The odds against such a leap are even higher for women, who are underrepresented in both IS and top management.

But during the last six months, three prominent women IS executives have beaten the odds and have parlayed their experience into an office on mahogany row. Their formulas for success included hard work, determination and broadly varied career paths.

Katherine Hudson, 45, formerly Eastman Kodak Co.'a corporate director of IS, and Patricia "Tosh" Barron, 49, formerly vice president of corporate information management at Xerox Corp., have been placed in charge of key business units at their respective Fortune 25 companies. At Weyerhaeuser Co., Susan Mersereau, 45, moved from the top IS job to a newly created vice president position in charge of corporate staff quality, corporate services and aviation.

In making their recent moves, these women have had to overcome what Barron calls the "double whammy" — a functional bias that hinders lateral movement and a gender bias that is still very much a reality for the highest level executive positions.

"Some men have those [functional bias] experiences, too, but it'a a difference of degree," Barron says. "There is a gender bias, however unconscious. At the high levels, women are still in the minority in a significant way. Men are not comfortable with women, period."

How can a woman in IS — or any other area — shatter these glass ceilings? "Persistence," says Barron, who in March was named president of Xerox's Office Document Products Division, the company'a largest unit and one of its most profitable. "You can't expect to be a one-year wonder. You have to stick with things and really get the experience you need. A woman who wants to advance can't wait for the offer to come along because her name is not going to be on the tip of anyone's tongue."

Betsy Ewald

Although the field of IS has played a big role in developing the careers of Barron, Hudson and Mersereau, none of them followed a traditional career ladder within IS, and all have had considerable experience outside the IS function.

"My interest in technology was never technical but came from the standpoint of improving organizational effectiveness," Mersereau says. "If you are viewed as very narrowly focused and tactical within IS, then your opportunities in the company are more restricted."

In Barron's opinion, any aspiring executive should quickly learn what area of the company is considered the corporate "mainstream" — the area most often plumbed for top executive talent and future chief executive officers. Xerox, for instance, is renowned for mining its top brass from the U.S. sales and marketing organization.

Establishing a foothold in an area that'a considered an executive proving ground may require some sacrifices. Barron took several steps backward in terms of job level in order to obtain a post in Xerox' U.S. marketing group. Three years into her employment at the company, she gave up the directorship of Xerox'a fledgling China project (whose charter was to establish a presence for the company in China) to become the mid-Atlantic region sales manager in 1982.

When Xerox reorganized into new divisions this year, Barron was tapped for direct line responsibility, which she says would not have happened without marketing experience that put her in contact with customers.

"Unlike some other senior level executives, Tosh is always thinking outside the company walls," says William Buehler, Xerox's senior vice president of corporate resources, who was instrumental in choosing Barron as one of Xerox'a nine division presidents.

Buehler calls Barron a "broad thinker" with the intellect and ability to size up situations and make decisions quickly. He says Xerox executives looked positively on Barron'a pre-Xerox experience as a consultant at McKinsey & Co.

"She has a great deal of personal drive. Once she sets her mind on something, she gets it done," Buehler says.

Like Barron, Hudson also says she believes in the importance of taking calculated risks to move to new areas. In her case, that area was IS.

Continued on page 116

Wilder is *Computerworld*'s senior editor, management.

- **Researcher: Women tend to support line positions**
- **Is education a sticking point?**
- **Mentoring has not been a big factor**

Continued from page 115

Although she began her Kodak career as a systems analyst in 1970, Hudson logged stints in finance, legal, public affairs and shareholder relations before becoming general manager of the Instant Photography Products business unit in 1984. Three years later, she accepted the challenge of heading a new corporate IS unit.

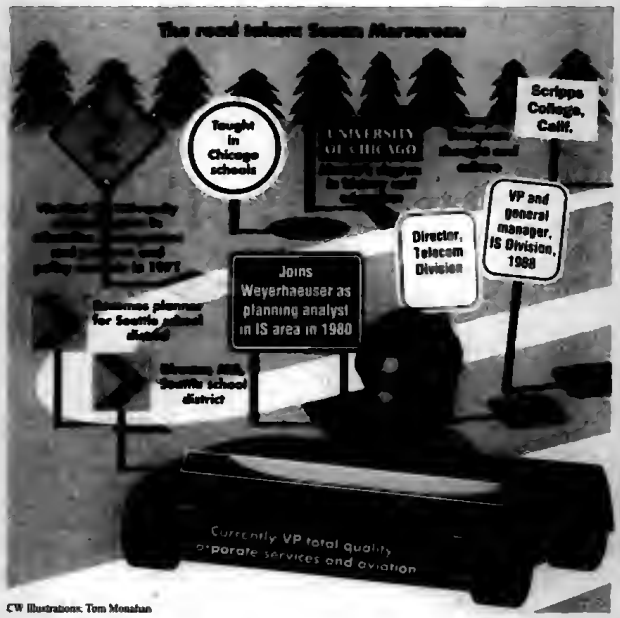
"I call it career kayaking," says Hudson, now vice president and general manager of Printing and Publishing Imaging, Kodak's largest business unit. "In the 1990s, career paths will look much more like a river than a ladder that you climb rung by rung. You should explore different ebbs and flows, and many of your moves are lateral or what may appear to be backward."

Breaking tradition

Such moves can open executives up to new ways of approaching traditional functions. Witness Hudson's 1989 landmark services contract with IBM, Digital Equipment Corp. and Businessland, Inc., a decision that raised eyebrows in Kodak's executive ranks and the IS community. This "break the mold, kill the sacred cow" thinking may be just what Kodak's beleaguered imaging business needed, observers say.

"A whole lot of male executives have failed to grow that business in the last 10 years, and it was time for a change," says Albert Turner, a financial analyst who follows Kodak for Duff & Phelps, Inc. in Chicago. "Kodak has an in-house management team with an inbred culture, and their costs have never had the attention that they should have."

Mersereau's career has been varied in a different way — a good deal of it took place outside the corporate environment. Before joining Weyerhaeuser in 1980, Mersereau taught in Chicago's inner-city schools and later evaluated urban education programs for the U.S. government. She worked in education management at the University of Washington and eventually became director of MIS for the Seattle school district.



CW Illustrations: Tom Monahan

Her Weyerhaeuser career was exclusively in IS until this year, although Weyerhaeuser's IS unit was run as a separate business with bottom-line responsibility and outside customers. As head of that business, Mersereau became one of two women at the vice president level at Weyerhaeuser.

Mersereau, Barron and Hudson are members of a very small minority. At a time when women make up about 50% of the U.S. work force, less than 5% of the senior management positions at a majority of Fortune 500 companies are filled by women. That may be partially due to a catch-22 situation identified by Catalyst, a New York-based research organization that works with companies to effect change for women (see story below).

According to Catalyst research, women often lack the line experience considered requisite for high-level executives because they have been slotted into staff functions — such as human resources, finance or IS — early in their careers. In a recent Catalyst survey of 50 human resources managers at Fortune 500 companies, 60% said putting women in line jobs is seen as risky in their companies.

"There is a perception that women will have a lower commitment to their careers and will be less willing to work long hours, relocate or work on a factory floor," says Mary Mattis, vice president of research at Catalyst. "These are perceptions that have not necessarily been tested."

Rising to the occasion

Some say they believe that given the opportunity to cross functions and handle very different tasks, women may be better at doing so than men. "I think women have proven that they are more adaptable and more intuitive in the way they manage and solve problems," says Carolyn Leighton, founder and executive director of the 300-member International Network of Women in Technology and president of Criterion, a Sherman Oaks, Calif.-based research firm.

Hudson likes to theorize that different gender-based skills date back to the hunter-gatherer era, when men's main task

'Unfortunately, the inclination is to stay where it's safe'

Women should gain as much experience as possible in line positions, researcher says

Mary Mattis is vice president of research at Catalyst, a New York-based, not-for-profit research firm working with corporations to effect change for women. Catalyst is probably most visible in the business community because of President Felice N. Schwartz, whose two Harvard Business Review *articles on women in the corporate world* ("Management Women and the New Facts of Life" *and* "Women as a Business Imperative") *have provoked much discussion and controversy.*

In an interview with Computerworld *senior editor Clinton Wilder, Mattis discusses some of the "glass walls" women face in gaining broader acceptance in business.*

Mary Mattis

Q What do you see as the problem with acceptance of women in the high ranks of business?

A Women today are basically getting the same kind of academic training as men and are evaluated as comparable to men at the entry level. So you would expect their career paths would be comparable, but something happens along the way to make them far more represented in staff jobs than in line jobs. [Catalyst defines line jobs as those management-level positions involved in product delivery and having revenue-producing responsibilities. Staff functions, such as information systems, support line jobs — ed.]

Q What causes that particular situation?

A One of the major barriers is that managers are averse to taking risks with women in areas of line responsibility. Unless there is a deliberate attempt to look at women's career paths, there is not very much lateral mobility. So women tend to move along in a vertical path on the staff side and then often run into the glass ceiling.

Q This seems to be a chicken-and-egg situation. How much of the lack of lateral mobility is due to true gender bias vs. women simply not choosing to move into line jobs?

A More and more women are saying they are willing to make the kinds of sacrifices needed for line management, but no one is asking them because the perception is they are not going to do it or that they will leave as soon as they have families.

The older generation of men, in particular, are uncomfortable with the idea of a woman going into a blue collar plant environment and toughing it out or dealing with difficult clients.

Q What should women who have high-level executive ambitions do?

A Women have to realize they cannot be really successful with staff-only jobs. That means they must take what may appear to be a demotion or a lateral move if it means learning more of the business.

Unfortunately, the inclination is to stay where it's safe. Women [in staff jobs] think if they just work harder and longer, they will succeed. But there is less and less acceptance of this vertical career path model. Companies are much more interested in getting a broad range of experience. And if you are already on the line side, it is much easier to get the staff experience.

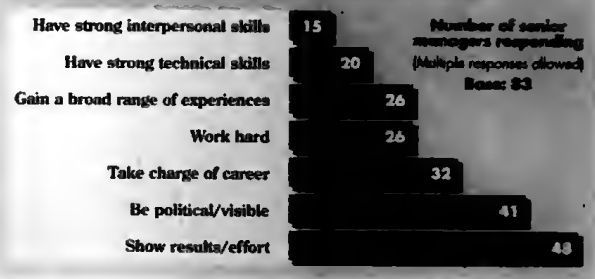
Q What should companies be doing to promote more equal opportunities?

A Companies need to be aware of how they are channeling women and think more about rotations, especially at younger ages when women are more flexible. Midlevel women are going to encounter the glass ceiling unless someone addresses it by making an effort to find high-potential women in that group and groom them.

The entry level in corporations today is looking more and more like a 50-50 gender split. It doesn't make sense to eliminate half of that talent pool at the high executive levels.

Go-getters

Senior managers say women who want to advance should do the following



Source: Catalyst

CW Chart: Michael Siggins

was to hunt for food in the wild while women "multitasked," taking care of clothing, shelter and children at the same time.

Hudson says her life as a business unit head in the 1990s is a multitasking model. Her tasks during the morning of her interview with *Computerworld* ranged from attending a long-term strategy session to hiring a secretary to meeting with an attorney and a human resources manager.

Mersereau and Barron, however, do not necessarily agree that multitasking is a gender-based skill. "That is certainly true for some women, but I've seen men who multitask very well and women who can't," Barron says. "I can't make a clear categorization."

Good start in IS

All three executives concur that their IS experience was invaluable in gaining the kind of broad corporate overview highly valued by senior executives. Although IS may be considered a staff or support function, it is a unique one that touches all aspects of the corporate mission.

"I'm not sure I have a field I would call my own, but IS is clearly near and dear to my heart," Hudson says. "It's one of the few disciplines in a company where you have to look at the whole picture and the one most closely connected with [business process] re-engineering."

As head of the Imaging Products Group, Hudson, who is Kodak's first woman vice president of an operating unit, is responsible for re-engineering challenges such as shortening product cycles and improving customer service.

Having been a big customer of the IBMs and DECs of the world, Hudson says she believes she will be more attuned to the needs of Kodak's customers in her new position. "I can really identify with a company looking to Kodak for things like toll-free hot lines and fast service," she says.

Hudson's successor as IS chief at Kodak says Hudson's track record as an innovator was a key factor in her promotion. Hudson's strength is "not her background in IS as much as her ability to address business issues," says Candy Obourn, vice president and director of IS and business processes. "She was always able to assess and communicate the impact of IS decisions to the company in financial terms."

Mersereau says she believes her IS experience fits perfectly with her new role in overseeing quality for all of Weyerhaeuser's corporate staff organizations: finance, human resources, corporate affairs and technology. "The more a company focuses on using facts, data and measurement in all of its processes, the more it needs IS professionals to play a strong role," she says.

"Susan is results-oriented," says William Stivers, Weyerhaeuser's senior vice president and chief financial officer and Mersereau's boss. "The press is full of stories about quality programs that have not delivered. Total quality is a means to an end, and you need results-oriented people like Susan to make it work."

Stivers says Mersereau's successful implementation of quality initiatives in IS was a key factor in her promotion. He also cites Mersereau's interpersonal skills, high respect level among other senior executives and her ability to manage change.

'Fertile ground'

Mersereau, Barron and Hudson all agree that managing in an effective IS organization that touches and enables all aspects of an enterprise is an excellent entry on the resume — in conjunction with direct business experience.

"I think it's a very fertile ground for good businesspeople," Hudson says. "For anyone who has managed IS in a progressive 1990s way — not as the Queen Dweeb of the 1970s — the transition is relatively easy."

Xerox's Buehler agrees, noting that IS experience was considered an important feather in Barron's cap. "At Xerox, we have asked ourselves what functions are critical to changing the way we work: information management, human resources and quality," he says. Buehler adds that he thinks Barron's replacement as IS chief, Patricia Wallington, is also destined for bigger and better things. "We see it as a job for developing future talent." •

Doing it on their own

Much has been made of the need for strong female role models to help women succeed in positions traditionally held by males. But neither Xerox's Patricia "Tosh" Barron nor Weyerhaeuser's Susan Mersereau point to a specific mentor in their careers.

"I'm too ancient to have a female role model," Barron jokes. "Both at McKinsey & Co. [where she worked for three years before joining Xerox] and at Xerox, there have been different people — men and women — that I admired for different skills. I would hope that I am a role model, but I don't really believe in mentors who sort of pull someone along. Life doesn't work that way."

Mersereau admits that she's met people along the way that have influenced her, "but I don't think I've had true mentors. Information technology and telecommunications have been relatively new areas of business."

In terms of acting as a role model for other women, Mersereau says she's been told she is a mentor "but feel I don't give as much as I'd like to. Mentoring is a very active, very responsible process."

Schooled against math, science

One reason women do not reach as high levels as men in the IS and business worlds may have to do with education. According to statistics from the U.S. Department of Education, the number of women taking math and science courses — areas that tend to form the foundation of a business or technical career — is low compared with the number of men.

As a junior high school student in Rochester, N.Y., Katherine Hudson remembers having to fight against the prevailing view of the type of schooling women should receive.

Hudson was planning her ninth grade curriculum, which included courses in advanced placement history and Latin. Despite Hudson's academic talents, her school guidance counselor tried to steer her away from algebra because it wasn't considered a "girls' subject." But her father insisted that she take algebra, which paved the way for Hudson's future work in calculus and advanced statistics and a hugely successful business career at Eastman Kodak Co.

"It's an interesting and scary fact that that moment made a real difference in my career," Hudson says.

"I never could have done finance and a lot of quantitative things without that training," she notes.

CLINTON WILDER

Telling numbers

Percent of U.S. women entering high school with an interest in math and science: 9%

Percent entering college with that interest: 3%

Percent earning science- or math-related undergraduate degrees: 2%

Odds of U.S. female receiving Ph.D. in math and science: 1 in 1,000

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*Correction — dates quoted in IDC White Paper are incorrect. Correct dates for Object World 1992 are July 20-23.

MANAGER'S JOURNAL

EXECUTIVE TRACK

Mark W. Wetmiller has been appointed managing director of operations and technology at Burlington, Vt.-based **Banknorth Group, Inc.**, a five-bank holding company that comprises the state's largest commercial banking firm. Wetmiller, a 10-year veteran of Mellon Bank Corp., joined Banknorth in 1988 to head up data processing and operations at Brattleboro-based First Vermont Bank; he moved into a headquarters post in 1990.

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The Reader's Digest Association, Inc. has named four executives to oversee its global IS activities. As of May 1, **Pietro Molino**, the firm's director of operations since 1985, is general manager of MIS Europe; he is based in Swindon, UK.

Former U.S. director of technical services **Tom Pumo** moved to a similar post for MIS Europe. Replacing Pumo is **Albert S. Dammeyer**, who will operate out of Reader's Digest's world headquarters in Pleasantville, N.Y.

Ray Evans, former IS manager of the firm's UK operations, was promoted to associate director of Eurosystems Development for MIS Europe.

.....

Evansville, Ind.-based **Keller-Crescent Public Relations** has promoted information center supervisor **Susan Everett** to the post of IS manager. Everett, who served as systems and information center analyst at American General Finance in Evansville before joining Keller-Crescent in 1988, will be responsible for mainframe operations, personal computer systems, programming and data entry activities.

.....

Harvey R. Shrednick, vice president of Information Services at **Corning, Inc.**, the Corning, N.Y.-based glass maker, has been promoted to corporate senior vice president. His responsibilities remain unchanged.

Only the occasional moose . . .

IS managers in remote areas find ways to recruit and maintain talented workers

BY JAMES DALY
CW STAFF

The countryside around Fairbanks, Alaska, is a pretty terrific place to be if you're a bald eagle or a bighorn sheep. But not if you're an information systems director looking for a skilled programmer.

Yet out here in the barren tundra, David Leone must keep an IBM 3090, three Digital Equipment Corp. VAX 8800s, a VAX 8600 and a Hewlett-Packard Co. 3000-68 humming — and also make plans for an upcoming supercomputer. As director of administrative computing services at the University of Alaska, Leone's need for high-caliber IS professionals is every bit as critical as it would be if he were dodging crazed New York cabbies instead of wayward moose on his way to work each morning.

"We're way out, but my job is to make sure we're not way out of touch," Leone says.

Tall order

His concerns are not unique. While most managers aren't faced with the challenge of attracting crackerjack IS talent to a site just three hours south of the Arctic Circle, thousands of IS directors in remote locations routinely face the tricky task of staffing data centers in areas not traditionally thought of as rich in computer expertise.

And the situation is likely to grow in scope as more large corporate IS departments move from pricey metropolitan areas to less costly — and typically more remote — locations. In the last decade, for example, banking behemoths J. P. Morgan & Co. and Citibank NA have relocated some IS functions from Manhattan to Christiana, Del., and Sioux Falls, S.D., respectively.

The inadequate availability of trained analysts and programmers, coupled with long training cycles of new employees, can be emotionally crippling to any organization, but particularly to one accustomed to picking from the best and the brightest.

"Many IS directors will arrive in a more remote location and discover that recruiting trained personnel is not nearly as easy as they thought," says Peter Balbus, director of strategic planning at Compass America, Inc., a data center consultancy in Herndon, Va.

Geoffrey Orth

University of Alaska's Leone: *'We're way out, but my job is to make sure we're not way out of touch'*

Most IS managers in remote locations will be faced with two options in maintaining a stable of talented IS personnel: Grow your own or go outside the area. Those experienced in recruit-

Continued on page 122

Keeping tabs on the expense account tab

BY MITCH BETTS
CW STAFF

Travel and entertainment expenses are among most U.S. companies' biggest controllable costs — yet few firms do much about gold-plated expense accounts, according to travel management experts.

Digital Equipment Corp., for example, recently estimated that expense account abuse by its sales force — including a $1,024 bar bill and a $3,180 dinner cruise — amounts to $30 million a year [CW, March 30].

This presents information systems executives with the opportunity to become cost-cutting heroes if they can build systems that analyze travel costs, identify cost-saving opportunities and flag items that deviate from company policy, consultants said.

Many companies pay travel bills the same way they pay utility bills — that is, with little or no analysis. An automated expense-management system can save 21% to 27% of travel and entertainment costs, according to Guy Lescault, president of Professional Travel Associates, Inc. in Atlanta.

Ideally, the IS department should be represented on an application development team that includes the corporate travel manager and the accounting department, said Robert Langsfeld, a travel automation consultant based in San Diego.

Too often, however, IS is not involved, an omission that increases the chance of the system "bombing," he said.

There are several expense-management software packages on the market, including the popular Travelmaster from Covia Partnership in Rosemont, Ill.

The software can track cash advances, generate reimbursement checks, interface with reservation systems, monitor spending patterns and also flag expenses that exceed corporate allowances for meals or the use of nonpreferred hotels and airlines.

Some organizations, such as the United Nations and the state of California's government, have even developed artificial intelligence systems to analyze expense reports.

Stumbling block

However, one of the biggest obstacles to implementing the systems is getting the data into the system in the first place, according to Harold Seligman, president of Management Alternatives, Inc. in Atlanta.

Reservations data can be downloaded from the company's travel agency, but posttrip reports of actual expenses must be keyed into a computer either by the traveler, the traveler's secretary or the company's accounting department.

Big Brother-ish auditing of expense reports can also cause some anxiety among employees, but "it all depends on how you market it internally," Lescault added.

"The best approach is to explain that reducing travel costs will preclude the elimination of jobs," he said.

Items of interest from publications, speeches, surveys and research projects

Deliver us from evil

■ Andrall E. Pearson, a former PepsiCo, Inc. president and former business director at McKinsey & Co., takes a moralistic view of this country's current economic situation. Writing in the current *Harvard Business Review*, Pearson attributes the problems of U.S. businesses to the following "seven deadly sins:" "inconsistent product quality; slow response to the marketplace; lack of innovative, competitive products; uncompetitive cost structure; inadequate employee involvement; unresponsive customer service; and inefficient resource allocation."

Redemption is possible, Pearson says, but only through real commitment. His prescription: Determine what your company stands for; enforce higher standards of performance; strive for constant innovation; and create a performance-based reward system.

Source: *"Corporate redemption and the seven deadly sins," by Andrall E. Pearson,* Harvard Business Review, *May-June 1992.*

Out of the mouths of babes

■ Children could teach managers a lot about motivation, according to Greg Dennis, a longtime music teacher who compiled his students' ideas on motivation into a recent *Industry Week* article. One 10-year-old said, "The whole class has to listen to our teacher because she forgets to say anyone's name until after she has asked the question." Lesson for mangers: Your staff members will perform better if they are all made to feel equally responsible for the outcome of a project.

Source: *"Children could help us find the way: Ten-year-olds may know as much about motivation as our bosses — or more," by Greg Dennis,* Industry Week, *May 4, 1992.*

Meet smart

■ To avoid the constant onslaught of meetings that managers spend 70% of their days attending, Phyllis Behar at New York communications consulting firm Exec/Comm suggests finding alternatives such as electronic mail or conference calls. If these options are not feasible, she says, there are things that managers can do to make meetings more productive, including limiting attendance to those directly involved with the issue being discussed; setting strict time limits; and taking minutes and distributing them before memories start to fade.

Source: *"Is this meeting really necessary?"* Beyond Computing, *March/April 1992.*

Gates predicts

■ If you want to know where to invest your systems dollars, Microsoft founder Bill Gates says you should use your own body as a guide. "If you take anything that's a human skill — speech, listening, handwriting, touch — it's totally predictable that those are key technologies . . . that people should invest millions of millions of dollars in."

Source: *"Unstoppable Bill Gates" by Rich Karlgaard,* Upside *magazine, April 1992.*

Japan and the new worker

■ As Japan's workaholic work force prepares to retire, Japanese firms are finding that it takes some ingenuity to keep younger workers happy. Omron, an automation controls maker, has introduced sabbatical leave for its middle managers so they can pursue personal goals or take an extended vacation. Automaker Daihatsu gives prizes to employees who are active in community service. And Sumitomo Metal has created a "flexible thinking" policy in which the firm will pay half of an employee's weekend hotel bill to encourage him to partake in Tokyo's cultural activities.

Source: *"The lure of leisure,"* The Economist, *May 2, 1992.*

Early experimentation

■ The Association for Computer Training and Support is finding fewer "computer virgins" in its student populations. The Raquette, N.Y.-based association says its ranks of first-time computer users are thinning. They attribute user-friendly multimedia hardware and educational software to allaying users' fears.

Source: *"Computer virgins a vanishing breed,"* Industry Week, *May 4, 1992.*

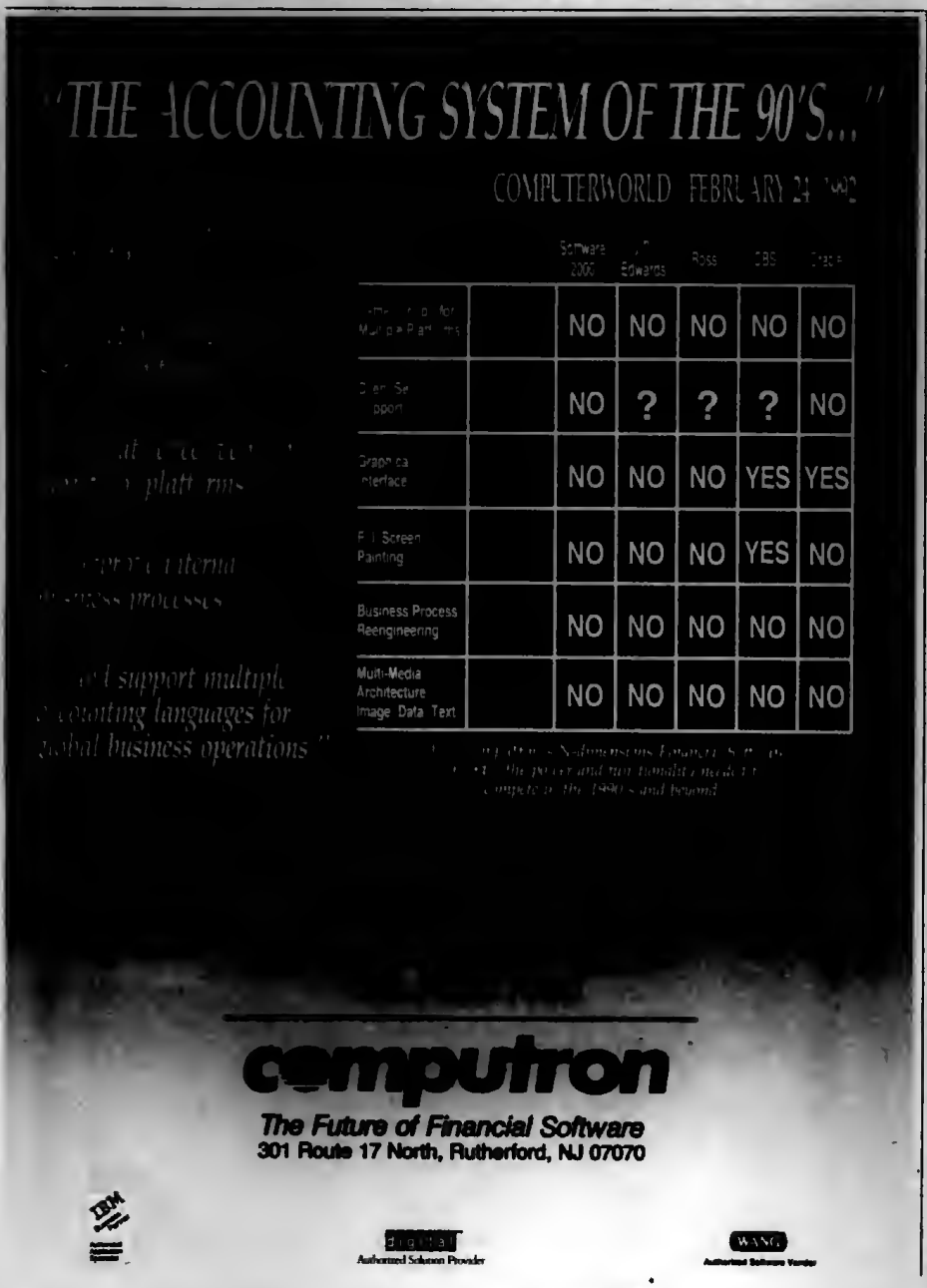
James Dean grows up

■ Larry Ellison, chairman, president and chief executive officer at Oracle Corp., likens gaining acceptance for new technology to winning over the parents of his high school girlfriend. A leather jacket and a rebel image may win you the admiration of your peers, he says, but neither will win over parents or large corporate customers.

"We've gotten off the motorcycle and put the black leather jacket in the closet," Ellison says. "We're driving four-door sedans now and paying a lot of attention to quality."

Source: *"No more Genghis Khan: Oracle designs a kinder, gentler future," interview by Joshua Greenbaum,* Management Review, *May 1992.*

Compiled by Kelly E. Duyer, assistant editor, features.



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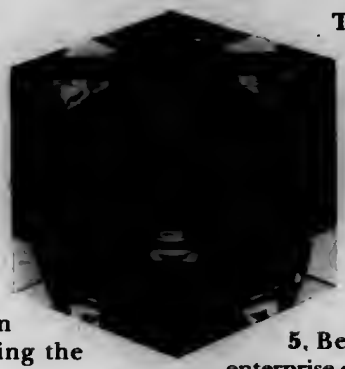

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Only the occasional moose . . .

CONTINUED FROM PAGE 119

ing professionals to remote locations offer the following tips:

• First, sell the job. Stress the unique professional opportunities the job provides. Leone, for instance, is now trying to establish a telecommunications link with the Commonwealth of Independent States.

• Emphasize that the area, while out of the way, is nonetheless key to the success of the organization. "Go out of your way to show that it's not an outpost but a critical ingredient with well-trusted people manning it," says Peter Miller, managing director at J. P. Morgan.

• Emphasize quality of life. Anyone who's spent 10 years catching the 5:15 train to Manhattan or The Loop can appreciate a 15-minute drive to work.

Darrell Powell, who formerly served as head of IS at the $100 million Black Hills Power and Light Co. in Rapid City, S.D., says he never locks his doors and that wild turkeys wander through his backyard. At an earlier job in Minneapolis, "the only wild turkeys I saw were out of a bottle," he says.

• Know what you're up against. Companies in major metropolitan areas may lure talent with stock options, profit sharing and niceties such as well-equipped fitness and day-care centers.

You may also be faced with the uncomfortable job of offering someone a salary that is below what they now make. A skilled IS staffer may earn between $55,000 and $70,000 a year in large metropolitan areas, but that salary dips to the $25,000-$45,000 range in smaller, more remote areas, Balbus says.

• Don't gloss over fears of moving. "Any big move is scary, and if you try to downplay those fears, people can see right through you," Powell says.

• Look at the ranks of other nearby companies that are relocating. When a nearby meatpacking company closed its doors and headed to Cincinnati, Powell was able to scoop up several programmers and analysts.

Promote from within

In addition, be aware that attracting outside talent isn't always smart. For instance, Leone says, it may be a good idea to groom in-house staffers for future higher level positions. Bringing in outsiders on a continual basis may cause resentment among employees, who may feel shortchanged.

Supplementing local staff with individuals from headquarters may also have less than satisfactory results. There is usually an initial burst of productivity by the expatriates, but resentment may fester among the local staff, whose salaries and benefits are likely to fall below those of their imported co-workers. Expatriates, too, may suffer. They may feel that the outpost is behind the times and they are becoming technically obsolete.

The best way to avoid this is to keep workers technologically up to date. Because it is typically too expensive to send all staff members to each important trade show, send one person with a list of topics to research. When he returns, have him brief the rest of your staff.

If you're still unable to fully staff the center, consider outsourcing it. Many firms have already outsourced portions of software development to such countries as India and Ireland, where the labor costs for comparable skills are much lower.

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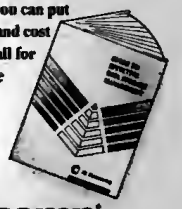

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COMMENTARY

Clinton Wilder

Take heed of social ills

The IS profession does not intersect very much with the world of South Central Los Angeles. Other than the absurdly ironic image of looters carting away stolen PCs, there might appear to be no relationship at all between life on inner-city streets and information technology.

But appearances are apt to be deceiving. The line between IS and L.A. may be straighter, and shorter, than most of us would like to admit. Much has been made in the news media about parallels between the disturbing events of the past three weeks and the eruption of Watts in 1965. How much, the pundits ask, has really changed in 27 years?

If you pose the same question about technology and the IS profession, the respondent might fall off his chair laughing. Come on — what *hasn't* changed? We have gone from punch cards to pen-based notebook computers, transforming the entire commercial world in the process. The rate of technology change continues to increase, whipping breakthroughs from impossibility to reality in less than half a decade.

Societal gap widening

While instantaneous communication has brought far-flung business enterprises and the world's nations closer together, the political and social fabric of the U.S. — always a fragile weave — is fraying down the middle. Recent statistics have proven that the gulf between rich and poor grew in the 1980s to the widest proportion in modern U.S. history. To borrow the title of an eerily prophetic movie released late last year and set in Los Angeles, many perceive that gulf to be as wide as the Grand Canyon.

Does information technology contribute to the widening of that gulf?

So far, it looks like the answer is yes.

If information is power and information technology represents the tools for wielding that power, then IS professionals are its stewards. With that stewardship comes many responsibilities. Some, such as data security and privacy protection, are widely known and publicized. But not enough thinking has been done about the role of information technology in relations between corporate enterprises and the communities in which they are based.

Any IS practitioner knows that information, when leveraged strategically, is in fact power: power to compete and win in the marketplace. Ultimately, the job of every IS professional today is to increase the overall organization's power by honing, tuning or improving that organization's IS. Information technology does indeed empower individuals, but it is individuals delivering technology who empower organizations.

But what of those who lack the financial and educational means to participate in the Information Age? No forward-looking person in American business needs to be reminded about changing work-force demographics and the backsliding of our education system.

More and more corporations are learning they must follow examples — such as that set by Motorola when it created Motorola University — and take upon themselves the teaching of basic work-force skills and computer literacy. Much to its credit, the Society for Information Management has decided to consider a possible position paper on computer literacy in a national education policy. Let us hope they move quickly and then follow words with action.

Regardless of where one stands in the politicized debate about the role of government in solving inner-city problems, the corporation clearly has a responsibility to channel human, financial and information resources back to the community.

That can be a difficult effort to make in a barely postrecessionary economy when companies are busy paring the payrolls and expenses they already have. One company that had a modest but successful minority outreach program involving IS — General Mills — decided to abandon it when tough economic times hit. Let's hope that companies facing similar decisions will go the other way, and even more of them will start new programs of their own.

A majority of U.S. citizens feel disconnected from the political system; that much is clearly evidenced by a growing preference for "none of the above" as the presidential candidate of choice. And an increasing number feel disconnected from the economic system, abandoning hope that they will ever be able to assume a productive role in it.

Because it is an economic system that becomes more technology-based every day, the ability to learn technology skills increasingly becomes the price of admission. If U.S. business fails to join in the battle to expand and enrich the technology learning process, the long-term economic and social damage could outstrip the recent devastation in Los Angeles. In the Information Age, IS professionals must play a key role in making sure that doesn't happen.

Wilder is *Computerworld*'s senior editor, management.

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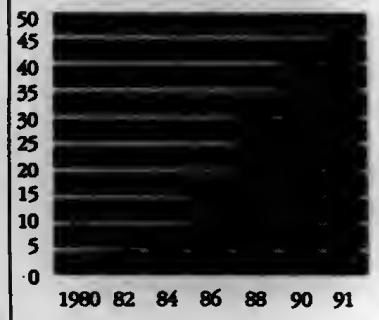
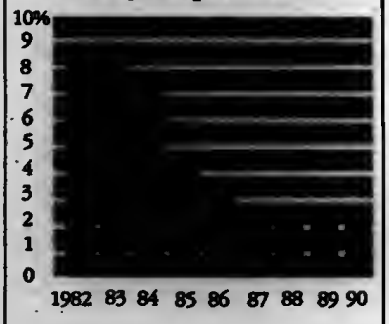


Fewer campus freshman are choosing computer careers**



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And then there were fewer: Downsizing takes its toll

BY CANDEE WILDE
SPECIAL TO CW

Suzanne Perez relies on her family for support. A co-worker of Dick Bodine resigned. Christopher Chen-see, s self-described "eternal optimist," tries to keep workers motivated.

Life in the wake of widespread layoffs has taken its toll on information systems survivors.

Chen-see, an analyst and programmer at Scott Paper Co. in Philadelphia, says it has been difficult to cope with losing friends while learning new work skills and assuming new duties, including additional management responsibility. He recently survived a 35% staff reduction in the IS department.

He says morale has been low since the downsizing, as people feel deserted by management and resentful that good employees were let go.

Chen-see has found that sharing feelings with other people at work can alleviate much of the stress, and he encourages the people he supervises to do so. "Sometimes it helps just to verbalize, and sometimes you get an insight," he says.

Irked by more work

Many people are angry, Chen-see says. "Employees are saying, 'It's all well and good to get rid of people, but now I have twice as much work.' Nobody wants to get twice as much work without compensation and with no promotions."

Chen-see, in his newly expanded role as a supervisor, says he has been trying to find out how to motivate people. "I'm the eternal optimist," he says.

"As the wounds are healing, you can bring in a consultant for a week, a month, three months, to have sessions on stress management. Things that you know [your staff] won't talk to you about, they will talk about to others.

"Things like that can help people cope, but it doesn't necessarily deliver change. People have been struggling to do that for years," he says.

Bodine, IS project coordinator at Bourns, Inc. in Riverside, Calif., says downsizing is in the cards at two of the company's divisions in Utah that recently merged. Management has already made it clear that there will be significant changes in strategic direction.

Guy Stuart

"None of us are real sure we're going to have a job. It's kind of a scary time right now," he says. One co-worker resigned, Bodine says, because he felt "the handwriting was on the wall. All of us are a little nervous."

Staff preoccupied

Already, the work load is increasing, Bodine says, and workers are spending more and more time talking about their situation.

"Prior to the consolidation, we all had our projects and we were all busy. Now we tend to spend time talking about what's going to happen as opposed to specific projects," Bodine explained. "The idea is kind of a support system."

Dennis Murphy, director of corporate information management at GTE Corp. in Stamford, Conn., says that although people are concerned about downsizing possibilities, they "are continuing to do good work. There is nothing to be gained by not doing so."

How the boss feels

Perez, vice president of MIS for an Alexandria, Va.-based company, is in the process of laying off one-third of her staff.

The layoffs are s result of the company's implementing new systems and equipment.

"Morale is cautious," she says. "Some are excited about the learning process, but then there is the wondering who is going to go. There is excitement in thinking, 'I'll still be here, and it's neat to know new stuff,' and [on] the other side, knowing people will be going."

Adding new technology and adjusting staff downward will continue for about six months, she says.

"It's terribly stressful now." Perez says she counts on her family for support when she feels "very wiped out and stressed out."

"I cry on my husband's shoulders s lot. I'm feeling very bad for many staff members, many of whom are young with young families. It's very hard to be laying them off," she says.

In the meantime, to bolster people's spirits in her department, Perez says she's "tried to make the training available to everyone. Longer term, it could help them somewhere else."

Wilde is a free-lance writer based in Easton, Conn.

> "NOBODY WANTS TO get twice as much work without compensation and with no promotions."
>
> CHRISTOPHER CHEN-SEE
> SCOTT PAPER

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Late shift offers night owls dream hours

BY ALICE BREDIN
SPECIAL TO CW

Working all night and sleeping all day doesn't sound like a job schedule most 9-to-5ers can fathom. But most information systems professionals on the night shift wouldn't trade it for anything.

Take Anthony Solitario, a technical support aide for the New York City Housing Authority. He has been working nights for 12 of his 14 years in the industry and wouldn't have it any other way. "It's like having every day off," he explains.

Among his other duties, Solitario processes and distributes reports from 10 p.m. to 6 a.m., Monday through Friday (see story below). He says he likes it because he has time during the day to see his kids and help his wife around the house.

Most after-hours workers process data, run long jobs, program and perform uninterrupted technical duties. Night shifts are busy, not filled with idle hours, according to these IS workers and managers. Most late-night workers say time flies; they're so busy there isn't time to be tired. Most also say they don't miss the social interaction of the day shift, although they don't have the freedom to order out for meals because most places aren't open that late.

Night shifts can start anywhere from 4 p.m. to midnight and can run from midnight to 8 a.m. Shifts can vary and so can the work. But most workers seem to enjoy having time off during the day. Many feel the quality of their work improves in this hassle-free environment, and they get paid, on average, 5% to 10% more than their day-shift counterparts, says Gerald Reynolds, a principal at Systems Personnel, Inc., an IS search firm in Media, Pa. Other benefits are never having to sit in rush-hour traffic, and those working in New York bragged that they can find parking on the street, which is unheard of during the day.

Personal pluses

For many IS professionals, hopes of a better personal life is the motivation for choosing the night shift. Parents say the shift allows them to spend more time with their kids. For instance, Solitario says that during school vacation, he enjoys more time with his children than he would if he worked 9 to 5.

For Andrea Arthur, a systems analyst at Sikorsky Aircraft in Stratford, Conn., the shift allows her to ensure that her newborn son is almost always cared for by his parents. "I take care of my son during the day, and my husband takes care of him at night. It's worth it just for that alone," Arthur explains. "I only spend $20 a week on child care for a kid who watches our son during the few hours when we are both at work."

Arthur had the option of taking a first-shift job when she was hired in August of last year, but she chose to work from 4 p.m. to midnight. At night, Arthur says, she has "the time to do jobs that take a longer time, like reprogram the boot commands and things that people during the day cannot get to." The only drawback to leaving her job at midnight, Arthur says, is that driving home that late makes her nervous.

For some people, the decision to work at night is decided by their nature. "Even when I didn't work nights, I was up all night," says Susan McCampbell, lead operator at Sun Financial Group in Wellesley, Mass. Other night-shift IS workers say they just adjusted to the schedule over time.

McCampbell started working the 7:30 p.m. to 8 a.m. shift almost 17 years ago. The key, she says, is that she only works three days a week. Because she has four days off a week, McCampbell says, the schedule doesn't interfere with her personal life.

Most night-shift IS professionals say working at night hasn't hindered their careers in any way. Even though management is not around at night, managers and workers say it's a clear who is getting their work done.

"The emphasis is on problem-solving and not leaving problems for the day-shift people to solve," says Philip Armato, data manager at the New York City Housing Authority. "By reading the turnover reports, I can tell who is learning from their mistakes," he says.

Armato says that in his four years on the job, no one has ever asked to be taken off the night shift. In fact, one employee who was brought on days asked repeatedly for about a year to be put back on nights until he finally resumed his old schedule, he says.

Room for moonlighting

Night work is also attractive to IS professionals with day jobs who use their nights to build a business on the side.

Bill Hines works as a senior programmer at a climate-control systems manufacturing company from 8 a.m. to 5 p.m., Monday through Friday. But about six nights a week, he also writes contract software for corporations as part of his business, Blue Sky Computing in New Cumberland, Pa.

"I see a real difference in my productivity and the quality of my code when I am working at home," he says. "As a programmer, you keep so many things in your head that you are at your best when you have consecutive hours of uninterrupted time."

Peter Kruczynski is a consultant who chooses to meet with clients during the early part of the day and then program until 3 or 4 a.m. His three employees have also adapted to this schedule by choice because they enjoy having free time during the day.

"It's not unusual for me to get a call from one of my programmers at 2 a.m.," he says. "They have realized that it's a great time to get a lot of work done."

Outlook stable

IS positions for traditional second and third shifts tend to be available in companies with mainframe operations that need continuous downloading jobs that can't be done during the day. A brokerage house, for instance, would do its batch processing all night.

Because these kinds of jobs can't be done during the day, according to Tony Carr, manager at Pencom Systems, Inc., a New York-based Unix recruiting firm, there is a certain stability in night work.

Bredin is a free-lance writer based in New York.

A day in the night of Anthony Solitario

10:00 p.m. Arrive at work. Production work is already in progress.
10:00 p.m. to 12:00 a.m. Sort print jobs.
12:00 to 1:00 or 2:00 a.m. File cartridge tapes. Check on reports printing throughout the night.
2:00 to 4:00 a.m. Sort and distribute the reports as they finish printing and duplicate jobs from reels to cartridges.
4:00 a.m. Lunch. Order food to be delivered or brown bag it.
4:30 to 6:00 a.m. Resume sorting and distributing reports. Another shift picks up where he leaves off and finishes by 8:30 a.m.
6:00 a.m. Leave work.
6:05 to 6:10 a.m. Arrive home. Go to sleep or have breakfast with kids and take them to school.
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5:30 p.m. Dinner time.
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Pittsburgh: Alive and kicking

Universities and start-ups keep IS scene surprisingly vital

BY JILL VITIELLO
SPECIAL TO CW

While no one is claiming an information systems hiring boom, observers agree that IS opportunities are anything but the pits in Pittsburgh.

Although Pennsylvania's second largest city suffered from the Rust Belt recession, the city survived by making a transition from a manufacturing to a service economy and staying slim.

"Pittsburgh companies remained lean and mean since then," says Joyce Bender, owner of Bender & Associates, a Pittsburgh-based executive recruitment firm. Because firms did not increase staff, they did not have to endure widespread layoffs with the most recent economic downturn.

Ensuring future success

Local IS professionals don't take their good luck for granted, and they continue to take steps to make sure that their city's IS community is on the leading edge.

For example, some large corporations with sizable IS shops have found ways to convert overhead to profit. Mellon Bank Corp.'s IS department, with 1,500 professionals, has established itself as a major provider of data processing functions. Its customers outsource their IS operations to the bank's IS department.

Right now, Mellon is actively seeking to hire IS employees, particularly those who are entry-level or have three to five years of programming experience, says Paul Earely, human resources consultant at Mellon.

Another huge IS shop that transformed itself from a cost center to a profit center is U.S. Steel International, Inc.'s Information Technologies Group.

U.S. Steel has targeted a different niche — systems integration for process industries — and has bid successfully on several contracts. With 600 IS employees and 150 contractors, Norb Connors, general manager of the Information Technologies Group, says he is not hiring additional people now. Because outside projects drive hiring, however, that may change as the project load increases.

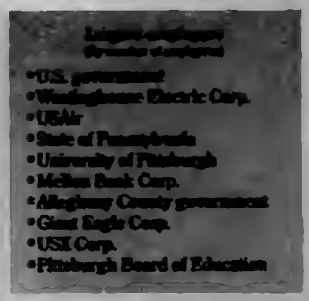
In Pittsburgh, traditional corporate IS departments are going the way of the steel mills and smokestacks that used to define the industrial and physical landscape. Nowadays, information services professionals based in Pittsburgh are likely to be working for a start-up technical firm, a university or a vastly changed IS department that markets its services to outside buyers.

Center for learning

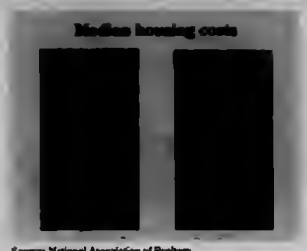
Besides being the headquarters for many corporations, Pittsburgh is home to two universities dominant in computer sciences: Carnegie Mellon University and the University of Pittsburgh. Both are part of an organization called the Pittsburgh Super Computing Center, a major hub of top-level expertise in scientific computing and the site of the most powerful computer tools available in the country, according to William Arms, vice president of academic services at Carnegie Mellon. He notes that although Carnegie Mellon is not actively recruiting IS professionals right now, "we always have room for stars."

In Pittsburgh, the worlds of scientific and business computing often overlap. Many large corporations — such as PPG Industries, Inc., Westinghouse Electric Corp. and Aluminum Company of America — have research and development divisions that emphasize the scientific aspects of computer science. On the other hand, university research projects often spin off into software development start-up firms.

In fact, some 800 of those small technical companies are members of the Pittsburgh High-Technology Council, a nonprofit trade association that fosters the advanced technology industry in Southwestern Pennsylvania.



Source: Pittsburgh Chamber of Commerce



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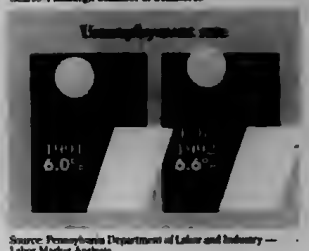

Source: Pennsylvania Department of Labor and Industry — Labor Market Analysis

New Pittsburgh software development companies are proliferating, and existing ones are growing, according to Holly Mauer-Klein, managing director of the Human Resources Management Group, a subsidiary of the Pittsburgh High-Technology Council. These companies are constantly looking for programmer/analysts, software engineers and software designers with experience in graphical user interface, object-oriented and C language programming, Mauer-Klein adds.

Custom-made skills

Corporate IS departments want IS professionals with specific industry experience as well as strong analytical and communications skills.

"Technical skills are important, but interpersonal skills are essential. We're a small shop — only 30 people — so we have to have people who can communicate well," says Robert Sickler, director of MIS at Joseph Horne Co., a department store chain based in Pittsburgh.

"The skills that are important to us are business acumen and a knowledge of processing industries," Connors says. "We can teach people how to code."

That's what Charles Southworth, vice president of corporate computer systems at Ketchum Communications, Inc., has done. In his previous job at Blue Cross of Western Pennsylvania in Pittsburgh, he took people with good interpersonal skills from the user community and integrated them into the IS department. He may do the same in his current position.

Vitiello is a speech and free-lance writer based in East Brunswick, N.J.

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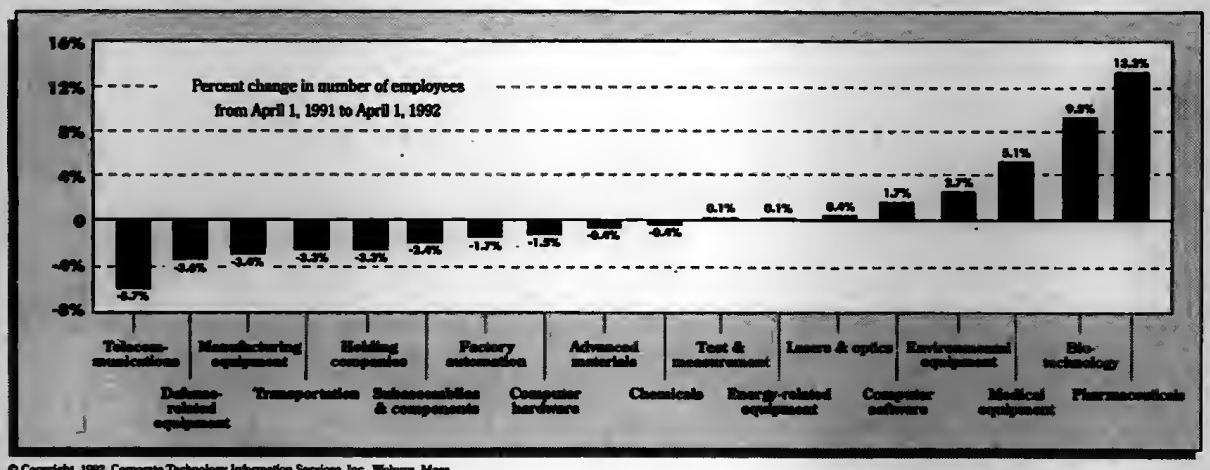

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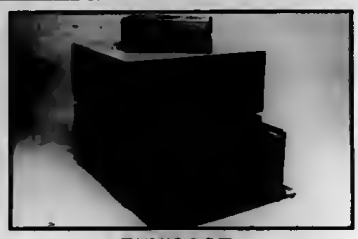

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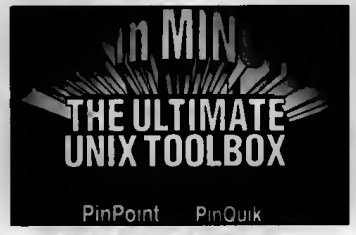

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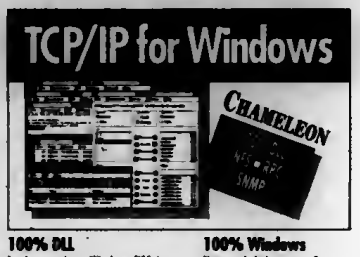

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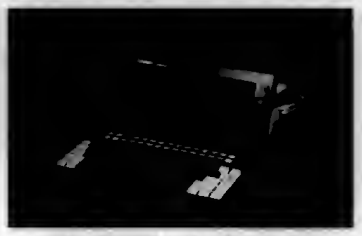

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Jukebox selection: Take your choice

BY ALICE LAPLANTE
SPECIAL TO CW

For users who need ready access to massive volumes of data but don't want to pay a lot for traditional magnetic storage, there is an increasingly popular solution — optical jukeboxes.

Optical jukeboxes work just like the tune machines, stacked with 45s, that you still occasionally see in old-fashioned coffee shops. When a user makes a request, a robotic arm finds the appropriate disc among rows of compact disc/read-only memory (CD-ROM), write-once read-many (WORM) or rewritable discs. Once the right disc has been located, it is transferred to the optical drive, which scans it to find the requested data or image.

Jukeboxes range from low-end CD-ROM types retailing for less than $1,000 that hold only six discs for single users or small workgroups, to high-performance jukeboxes holding up to 100 platters. High-end systems containing two or more optical drives sell for upward of $100,000 and are intended for departmental or enterprisewide access by hundreds of users.

Jukebox suppliers used to be limited, but in the past 18 months, several dozen companies have jumped into the marketplace to offer entire jukebox families with a broad range of solutions.

Among the top vendors are Filenet Corp., Hewlett-Packard Co., Cygnet Systems, Inc., Toshiba America Information Systems, Inc. and International Data Engineering, Inc. Another recent company to join the list is Systems Industries, Inc.

Jukebox classification

Based on the media they use, optical jukeboxes can be divided into four categories, says Bob Abraham, vice president at Freeman Associates, Inc., a market research firm in Santa Barbara, Calif.: CD-ROM; 5.25-in. WORM, greater than 5.35-in. WORM; and 5.25-in. rewritable, which also includes the newer multifunctional jukeboxes that read WORM and rewritable discs.

Each category of optical media also tends to be highly application-specific, Abraham says.

Jukeboxes that read CD-ROM discs are most often employed when there's a need for referential access to large amounts of preformatted data such as works of literature and encyclopedias.

WORM media, on the other hand, is used to record data. Many engineering firms, for example, want to keep records of subsequent drafts of a project for archival purposes. "The beauty of the WORM system is that you can never overwrite what you've previously recorded, and you therefore have a permanent audit trail," Abraham says.

Hardware concerns

Once the media has been chosen, the two main hardware issues are performance and storage capacity.

The more discs a jukebox holds, the longer it takes to load a disc into the optical drive. For archiving, speed is not an issue, but for claims or remittance processing, immediate access to data is essential and may be better handled by large-capacity jukeboxes with multiple drives.

Choosing the right jukebox is more complicated than simply evaluating hardware, however.

Because jukeboxes are generally a small component in a complex image management system, experts suggest buying them from a vendor or a systems integrator that can also provide the rest of the image management system. Few jukebox vendors provide software, however, and some don't even sell to end users.

In fact, it is risky to buy the hardware without the software, experts warn.

GTE Sylvania, Inc.'s first jukebox came without software. They tried to write the software in-house, only to scrap the project a year later, says Andrew Devlin, GTE's lead analyst.

Instead, the Ipswich, Mass.-based company turned to Epoch Systems, Inc., which "provided them with a turnkey system" to store their engineering drawings.

View working systems

However you decide to buy a jukebox, users agree the only way to choose a vendor is by viewing existing customer installations.

When Pacific Bell Directory put its Request for Information out into the jukebox vendor community, one of its requirements was that a vendor have a working system of similar size already in production at a customer site, says Andrea Winterbottom, manager of the document imaging group.

"Because it's a newer technology, our company didn't want to take any chances," and Filenet was one of the few vendors who could provide customer references of a working system of the appropriate size, she says.

LaPlante is a free-lance writer based in Palo Alto, Calif.

Sampler

Alphatronix, Inc.: Inspire 57G. $99,000; Inspire 93G. Starts at $125,000.

Hewlett-Packard Co.: HP Series 6300 line. $20,700 to $107,300.

Micro Design International, Inc.: LaserBank Library 5-32. $39,995.

Systems Industries,: Laser's Edge line. $92,000.

[redacted]

At NASA's Space Science Laboratory at the Marshall Space Flight Center in Huntsville, Ala., optical media stored in jukeboxes from Alphatronix, Inc. in Research Triangle Park, N.C., was chosen over magnetic media because it was much cheaper.

NASA needed a way both to store and rapidly access a growing bank of raw numerical data beamed down from a spacecraft. The data that NASA needed to store accumulated at a rate of 50M bytes per day, seven days a week, 365 days a year.

"Optical media was the best solution because of price," says Scott Storey, data systems manager.

NASA saw how much data could be stored on a $200 single rewritable 5.25-in. optical drive, compared with the price of equivalent magnetic storage, which ran in the thousands of dollars. NASA chose Alphatronix because it had originally bought Alphatronix's two-drive optical-disc reader.

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PS/2 Model 60	$650	$900	$325
PS/2 Model 70	$2,650	$2,800	$1,200
PS/2 Model 80	$2,050	$2,100	$1,100
PS/2 Model 95	$4,200	$4,600	$3,300
Compaq Portable II	$425	$500	$375
Portable III	$550	$650	$250
Portable 386	$2,000	$2,125	$1,000
SLT 286	$700	$900	$400
LTE 286	$900	$1,100	$500
Deskpro 286E	$500	$1,000	$325
Deskpro 386/33	$1,800	$2,000	$1,100
Apple Macintosh Classic	$875	$1,050	$700
SE	$775	$875	$600
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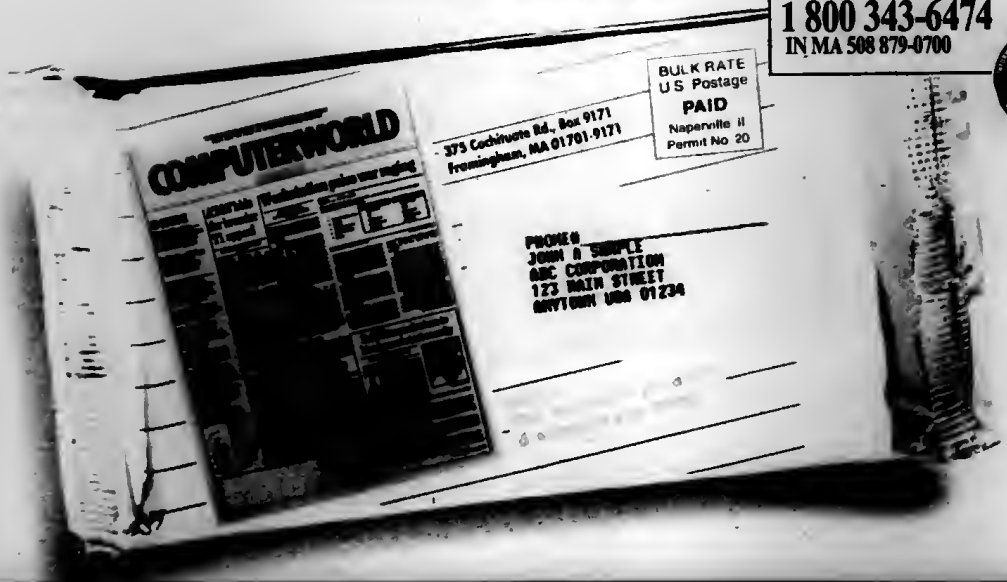

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Industry Almanac

FOCUS: MICROCOMPUTERS

Adding Some Flash to the Business
Bear, Stearns & Co., New York
May 8

The market for flash memory devices — durable storage facilities based on rewritable, solid-state circuits — is expected to grow from $130 million today to $1.5 billion in 1995. But cost and capacity issues will prevent flash products from replacing disk drives for the next few years.

Initially, the devices will do well in new markets such as handheld computers, where battery life, size, weight and ruggedness are more important than cost. Although **Intel Corp.** (INTC) and **Advanced Micro Devices, Inc.** (AMD) are pushing hard in the market right now, **Conner Peripherals, Inc.** (CNR) and **Maxtor Corp.** (MXTR) stand to benefit, too.

Conner announced a joint development deal with Intel and is expected to unveil products by year's end. Maxtor has not made any public statements, but Chief Executive Officer Larry Hootnick headed the flash memory group when he was at Intel, so Maxtor is likely testing the waters.

RECOMMENDATION CHANGES

DOWNGRADED FROM BUY TO HOLD: **Borland International, Inc.** (Bear, Stearns). Product delays and charges of $150 million, consequences of the **Ashton-Tate Corp.** acquisition, loom over Borland (BORL). The ship date for Paradox for Windows has slipped from March to June to sometime this summer, and dBase for Windows is due out the second half of this year.

Until product momentum returns, Borland's near-term stock price is not encouraging. Plus, **Microsoft Corp.**'s pending acquisition of **Fox Software, Inc.** may stall the database market in the coming months.

UPGRADED FROM HOLD TO BUY: **Advanced Logic Research, Inc.** (The Chicago Corp.). Advanced Logic (AALR) said it will start taking direct phone orders, expanding distribution channels beyond traditional resellers and distributors. A full-fledged mail-order campaign might grow during the next year. Cutting 50 employees (about 10% of its work force) the past quarter helped reduce expenses.

KIM S. NASH

Computerworld Friday Stock Ticker

CLOSING PRICES FRIDAY MAY 15, 1992

TOP PERCENT GAINERS	
CE Software (L)	20.00
Cognos Inc (L)	18.67
Intellicorp Inc.	15.38
Fibronix Int'l Inc.	12.20
Scientific Atlanta Inc.	11.94
Dallas Semiconductor	11.29
Data Switch Corp.	8.33
Gandalf Technologies Inc.	7.92

TOP PERCENT LOSERS	
Platinum Technology	-16.75
Cray Research Inc.*	-16.40
Network General	-13.41
Advanced Micro Devices	-13.29
Compression Labs Inc.	-12.42
Informix Corp.	-11.75
Chipcom Corp.	-11.68
Protean Inc.	-11.11

TOP DOLLAR GAINERS	
Cisco Systems Inc.	2.13
Scientific Atlanta Inc.	2.00
Wellfleet Communications	1.75
Barclac Inc.	1.50
Cognos Inc. (L)	1.50
Conner Peripherals*	1.25
Computer Sciences*	1.25
3M Co.	1.25

TOP DOLLAR LOSERS	
Cray Research Inc.*	-6.38
Intel Corp.*	-4.13
Microsoft Corp.*	-4.50
Parametric Technology (H)	-4.13
Informix Corp.	-4.00
Borland Int'l Inc.*	-3.88
Motorola Inc.* (H)	-3.63
Autodesk Inc.	-3.25

Exch	52-Week High	52-Week Low	Company	May 15 Close	Wk Net Change	Wk Pct Change
Communications and Network Services — Off 1.48%						
OTC	15.00	6.75	3COM Corp.*	11.13	-0.75	-6.32
NYS	65.75	55.75	American Info Techs Corp.*	63.50	0.88	1.40
NYS	44.63	32.88	AT&T* (H)	42.63	-1.13	-2.57
OTC	4.25	1.13	Ariel Communication Corp.	1.31	0.06	5.04
NYS	50.63	40.25	Bell Atlantic Corp.	43.50	0.00	0.00
NYS	52.63	43.38	Bellsouth Corp.	48.13	-0.63	-1.25
NYS	6.38	4.75	Bolt, Beranek & Newman	5.38	0.00	0.00
NYS	65.88	50.25	Cabletron Systems	47.75	-2.13	-4.28
OTC	31.00	11.75	Chipcom Corp.	21.75	-2.88	-11.88
OTC	43.63	14.00	Cisco Systems Inc.	40.88	2.13	6.48
OTC	35.25	13.75	Compression Labs Inc.	16.75	-2.38	-12.42
OTC	4.25	1.25	Data Switch Corp.	1.63	0.13	8.33
NYS	20.63	12.38	Digital Comm. Assoc.*	16.00	-0.75	-3.80
OTC	16.00	8.50	Digital Systems Int'l Inc.	11.00	-0.50	-4.35
OTC	8.88	3.63	DSC Communications	4.38	-0.25	-5.41
OTC	10.88	4.88	Fibronix Int'l Inc.	5.75	0.63	12.50
OTC	37.50	13.50	Fibmet Corp.	24.50	-2.00	-7.55
OTC	3.63	1.13	Gandalf Technologies Inc.	2.56	0.16	7.92
OTC	2.50	1.16	Gateway Communications	1.69	-0.06	-3.54
NYS	5.50	2.13	General Datacomm Inds.	4.13	-0.13	-2.94
ASE	5.88	0.50	Go Video	3.13	-0.38	-10.71
NYS	35.00	26.13	GTE Corp.*	32.25	0.00	0.00
NYS	70.63	50.00	ITT Corp.	65.88	-2.13	-3.13
OTC	36.13	25.25	MCI Communications Corp.	31.25	-1.38	-4.21
OTC	14.88	5.75	Microcom Inc.	11.50	0.25	2.22
NYS	16.25	8.25	Network Equipment Tech.*	14.50	-0.50	-3.33
OTC	25.88	6.75	Network General	17.75	-2.75	-13.41
OTC	20.00	8.50	Network Systems Corp.	6.38	-0.75	-7.50
OTC	17.88	5.50	Newbridge Networks Corp.	15.38	-0.63	-3.91
NYS	49.25	35.88	Northern Telecom Ltd.*	39.13	1.13	2.88
OTC	89.00	22.63	Novell Inc.*	50.25	-2.13	-4.06
NYS	82.38	68.13	Nynex Corp.*	77.75	0.75	0.97
OTC	37.50	16.50	Octel Communications Corp.	24.00	-0.25	-1.03
OTC	9.88	5.63	Penril Data Comm. Ntwks.	6.13	0.25	4.25
OTC	53.00	31.00	Picturetel Corp.	35.75	-3.00	-7.74
OTC	18.75	9.75	Protean Inc.	12.00	-1.50	-11.11
NYS	19.75	11.63	Scientific Atlanta Inc.	16.75	2.00	11.94
NYS	66.00	48.38	Southwestern Bell Corp.	63.00	0.75	1.20
NYS	31.50	50.75	Sprint Corp.	24.75	0.25	1.02
OTC	37.75	14.25	Synoptics Communications	38.25	1.13	4.48
NYS	38.50	28.88	US West Inc.	32.50	-0.38	-1.05
OTC	41.25	21.25	Wellfleet Communications	32.75	1.75	5.65
PC and Workstations — Off 3.92%						
OTC	15.25	5.75	Advanced Logic Research	6.88	-0.38	-5.17
OTC	70.00	40.25	Apple Computer Inc.*	50.63	-1.38	-2.22
OTC	32.25	14.50	AST Research Inc.*	18.00	-0.88	-4.84
NYS	19.25	10.13	Commodore Int'l	11.50	-0.63	-5.15
NYS	38.75	22.13	Compaq Computer Corp.*	24.88	-0.25	-1.00
OTC	29.00	13.81	Dell Computer Corp. (H)	25.50	-2.50	-8.93
OTC	7.75	3.00	Everex Systems Inc.	5.75	-0.13	-2.13
NYS	34.00	31.25	Harris Corp.	25.63	0.50	1.75
NYS	85.00	64.63	Hewlett-Packard Co.*	77.38	-3.25	-4.03
OTC	17.63	7.38	Mips Computer Systems	8.50	-0.63	-8.85
NYS	29.75	13.25	Silicon Graphics	17.25	-0.75	-4.17
OTC	38.88	20.75	Sun Microsystems Inc.*	28.38	-1.38	-4.82
NYS	34.38	23.38	Tandy Corp.*	27.50	-0.75	-2.66
NYS	11.13	5.13	Zenith Electronics	8.00	-0.13	-1.54
OTC	25.50	6.75	Zeos International Ltd. (L)	6.25	-0.75	-7.50
Large Systems — Off 3.58%						
ASE	50.63	11.63	Amdahl Corp.*	18.88	-0.88	-4.63
NYS	12.75	7.50	Control Data Corp.	11.75	-0.25	-2.08
NYS	73.25	8.88	Convex Computer	9.00	-0.25	-2.70
OTC	19.63	2.88	Cray Computer	13.63	0.25	7.41
NYS	52.25	31.50	Cray Research Inc.*	32.50	-6.38	-16.40
NYS	22.50	6.00	Data General Corp.	8.63	-0.50	-5.48
NYS	71.75	43.50	Digital Equipment Corp.*	44.13	-1.25	-2.75
OTC	107.38	61.63	IBM*	81.63	-1.38	-1.67
NYS	127.50	93.50	Matsushita Electronics	105.50	-1.50	-1.40
OTC	28.25	10.50	Pyramid Technology	10.75	-0.75	-6.52
OTC	17.88	7.50	Sequent Computer Sys.	11.50	-0.38	-3.16
OTC	37.50	16.13	Sequoia Systems Inc.	16.00	-0.25	-1.54
NYS	34.25	27.25	Sinnus Computer Inc.*	45.00	-1.50	-3.25
NYS	17.63	9.50	Tandem Computers Inc.*	13.38	-0.13	-0.93
OTC	3.88	1.13	Tandon Corp.	1.63	-0.06	-3.73
NYS	11.75	3.25	Unisys Corp.*	6.25	-0.88	-8.64
ASE	7.50	2.06	Wang Labs Inc. (B)*	3.75	-0.13	-3.23
Software — Off 3.58%						
OTC	68.50	37.50	Adobe Systems Inc.	45.25	-1.50	-3.21
OTC	13.25	3.50	Al Corp.	6.75	-0.25	-3.57
OTC	54.50	16.00	Aldus Corp.	19.75	-2.25	-10.23
OTC	18.75	10.13	American Software Inc.	13.00	-0.25	-1.88
OTC	20.00	7.80	Ask Computer Systems	13.88	-0.63	-4.31
OTC	52.75	23.25	Autodesk Inc.	50.75	-3.25	-6.56
OTC	37.75	12.63	Bachman Info. Systems	12.63	-1.38	-9.82
OTC	42.50	25.88	BGS Systems Inc.	34.75	-1.50	-4.14
OTC	73.00	23.00	BMC Software Inc.	45.25	-1.75	-3.72
OTC	50.50	8.75	Boole & Babbage	16.50	-0.50	-2.63
OTC	88.75	39.50	Borland Int'l Inc.*	44.75	-3.88	-7.97
OTC	11.25	4.50	CE Software (L)	6.00	1.00	20.00
ASE	13.75	6.50	Cheyenne Software Inc.	11.50	0.25	2.22
OTC	50.38	7.25	Cognos Inc. (L)	9.13	1.50	16.67
Computer Associates* — Off 2.78%						
NYS	17.00	7.50	Computer Associates*	13.63	-0.88	-6.03
OTC	21.50	12.00	Comshare Inc.	13.50	-1.00	-6.90
OTC	47.88	15.00	Edsel Corp.	26.00	-2.13	-7.58
OTC	16.50	6.25	Goal Systems Int'l	18.63	-0.75	-4.32
OTC	25.50	11.50	Group I Software	15.00	-0.75	-4.76
OTC	6.63	4.13	Hogan Systems Inc.	4.88	-0.13	-2.76
OTC	38.25	16.38	Information Resources	20.75	-1.75	-7.75
OTC	36.00	5.38	Informix Corp.	50.00	-4.00	-11.75
OTC	3.63	1.06	Intellicorp Inc.	1.88	0.25	15.88
OTC	50.25	18.25	Intergraph Corp.	16.50	-0.38	-1.49
OTC	17.00	4.88	Interleaf Inc.	11.50	-0.50	-4.17
OTC	20.25	7.38	Interactiv Inc.	14.00	-1.38	-8.94
OTC	33.50	10.50	Knowledgeware Inc.	11.25	0.25	2.27
OTC	46.25	20.75	Legent Corp.*	32.75	-1.75	-5.07
OTC	40.75	16.00	Lotus Development*	29.38	-2.13	-6.75
OTC	7.38	2.38	Mace Software	3.88	-0.25	-6.06
OTC	22.25	11.50	Mentor Graphics	13.00	-0.75	-8.45
OTC	20.50	6.50	Micrografx Inc.	17.50	-0.25	-1.41
OTC	133.25	50.00	Microsoft Corp.*	110.00	-4.50	-3.93
OTC	21.13	7.00	Oracle Corp.*	15.88	-0.13	-0.81
OTC	40.25	11.88	Parametric Technology (H)	34.88	-4.13	-10.58
OTC	11.00	6.88	Phoenix Technologies	6.38	0.00	0.00
OTC	75.25	6.38	Platinum Technology	14.25	-2.88	-16.78
OTC	46.50	27.50	Progress Software Corp.	32.00	-2.00	-5.88
OTC	26.63	11.50	Quarterdeck Office Sys.	14.88	-1.50	-9.38
OTC	26.50	10.00	Realsoft	13.88	-0.63	-4.31
OTC	17.75	6.75	Ross Systems	8.75	-0.88	-9.41
OTC	26.25	12.25	Software Publishing Corp. (L)	12.75	-0.75	-5.56
OTC	6.50	2.00	Software Toolworks Inc.	5.38	-0.38	-6.52
OTC	7.25	1.75	Spinnaker Software	4.00	-0.13	-3.03
OTC	16.50	8.25	State of the Art	11.25	-0.50	-4.38
NYS	25.25	10.88	Sterling Software Inc.	16.50	-0.75	-4.35
OTC	50.00	14.25	Struct. Dynamics Research	17.00	-0.50	-2.86
OTC	31.75	15.00	Sybase Inc.	24.75	-1.00	-8.71
OTC	51.00	16.50	Symantec Corp.	38.75	-2.75	-6.88
NYS	15.50	7.25	Systems Center Inc.*	6.25	-0.63	-8.33
OTC	31.00	6.88	System Software Assoc.	26.50	0.75	2.91
OTC	23.75	18.50	Walker Interactive Systems	20.75	0.50	2.47
OTC	6.63	3.38	Wordstar	2.75	0.00	0.00
Semiconductors — Off 2.78%						
NYS	31.50	6.38	Advanced Micro Devices	15.50	-2.38	-13.29
NYS	11.38	7.00	Analog Devices Inc.	10.13	-0.13	-1.22
OTC	18.88	6.75	Atmel Corp.	8.63	0.00	0.00
OTC	14.13	7.50	Chips and Technologies	6.25	-0.38	-4.35
NYS	22.63	8.00	Cypress Semiconductor Corp. (L)	6.75	-0.50	-4.88
NYS	10.25	6.25	Dallas Semiconductor	6.63	-0.88	-11.38
OTC	68.75	38.50	Intel Corp.*	48.25	-4.13	-8.00
NYS	10.75	6.25	LSI Logic Corp.	6.75	-0.38	-5.38
NYS	22.38	10.88	Micron Technology	14.00	-0.38	-2.61
NYS	63.75	54.00	Motorola Inc.* (H)	75.50	-3.63	-4.41
NYS	11.50	3.88	National Semiconductor*	6.75	-0.50	-4.88
OTC	27.00	13.00	Sierra Semiconductor	16.75	-1.00	-5.63
NYS	40.50	38.00	Texas Instruments*	38.13	-0.13	-0.34
OTC	10.63	5.88	VLSI Technology	7.25	-0.63	-7.94
OTC	14.00	3.75	Weitek	5.13	0.38	7.89
ASE	5.00	2.00	Western Digital Corp.	4.38	0.13	2.94
OTC	32.50	19.25	Xilinx	25.00	-1.25	-4.99
OTC	11.50	4.25	Zilog Inc.	7.50	-0.25	-3.23
Peripherals and Subsystems — Off 1.80%						
OTC	3.31	1.00	Aperius Technologies	1.88	0.06	3.88
OTC	10.00	2.75	Archive Corp.	7.88	0.13	1.58
OTC	24.00	11.25	Barclac Inc.	22.50	1.50	7.14
OTC	23.50	5.25	Cambex Corp.	12.00	-1.00	-7.69
ASE	14.38	7.00	Cognitronics Corp.	12.75	-0.50	-3.77
NYS	23.25	12.50	Conner Peripherals*	23.13	1.25	5.71
ASE	16.66	3.25	Dataram Corp.	15.88	0.00	0.00
NYS	16.88	4.88	EMC Corp.	14.75	+1.00	-6.25
OTC	6.38	4.75	Emulex Corp.	7.38	0.00	0.00
OTC	23.00	14.75	Evans & Sutherland	17.50	-0.50	-2.78
OTC	40.63	13.38	Exabyte	32.13	-2.88	-8.21
OTC	27.25	15.50	Intelligent Info. Systems	25.75	0.00	0.00
OTC	11.25	4.00	Iomega Corp.	8.88	-0.13	-1.78
OTC	34.75	14.50	IPL Systems Inc.	20.50	-3.25	-8.88
OTC	24.50	11.75	Kennag Inc.	13.00	-0.63	-4.59
OTC	14.00	1.63	Maxtor Corp.*	12.13	-0.50	-3.98
OTC	15.38	5.50	Micropolis Corp.	10.13	-0.75	-6.90
NYS	88.75	83.50	3M Co.	94.75	1.25	1.34
OTC	8.75	3.50	Pinnacle Inc.	4.50	-0.25	-5.26
NYS	36.75	9.00	QMS Inc. (L)	6.25	0.00	0.00
OTC	16.00	6.88	Quantum Corp.	15.00	0.00	0.00
OTC	12.25	5.00	Radius Inc.	10.25	0.00	0.00
NYS	12.88	8.88	Recognition Equipment	9.00	-0.13	-1.37
OTC	13.13	5.38	Reton Inc. (H)	12.25	0.13	1.03
OTC	18.75	7.13	Seagate Technology* (H)	15.88	-0.13	-0.78
NYS	75.00	34.75	Storage Technology*	27.38	-1.75	-5.47
NYS	20.88	16.00	Tektronix Inc.	19.13	0.38	2.00
NYS	82.25	51.80	Xerox Corp.	70.63	-1.63	-2.25
Services — Off 1.68%						
OTC	27.25	16.25	American Mgmt. Systems*	23.13	0.00	0.00
NYS	6.38	2.88	Anacomp Inc.	4.13	0.13	3.13
OTC	19.00	12.00	Analysts Int'l	16.50	0.75	4.23
NYS	48.00	29.50	Auto Data Processing*	48.88	-2.00	-4.16
NYS	24.53	12.50	Comdisco Inc.*	14.75	-0.75	-4.84
OTC	13.50	7.75	Computer Horizons	10.13	-0.88	-7.85
NYS	94.88	52.25	Computer Sciences*	72.25	1.25	1.75
NYS	10.13	7.50	Computer Task Group	8.25	-0.13	-1.53
OTC	18.25	7.75	Corporate Software	15.50	-1.00	-6.06
OTC	30.75	12.75	Egghead Discount Software	23.25	-0.88	-3.63
NYS	33.06	23.00	General Motors E (EDS)*	29.00	0.13	0.43
OTC	30.88	6.88	Intelligent Electronics	16.88	-0.88	-7.45
OTC	14.88	2.50	Mentor	13.13	-0.75	-8.41
OTC	15.75	6.75	Microage Inc.	10.25	0.50	5.13
OTC	41.25	50.25	Paychex	37.38	0.38	1.01
NYS	73.00	45.25	Policy Management Sys.	67.50	0.88	1.92
NYS	42.50	16.63	Reynolds and Reynolds (H)	42.25	0.50	1.20
OTC	32.00	21.25	SEI Corp.	29.63	0.88	3.15
OTC	24.38	17.00	Shared Medical Systems	16.75	-0.75	-3.66
OTC	24.88	13.50	Sungard Data Systems	22.75	-0.75	-3.18
NYS	6.13	1.13	Ultimate Corp.	1.75	-0.13	-6.67

KEY (H) = New annual high reached in period (L) = New annual low reached in week
* Companies tracked in Computerworld Stock Index

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IN BRIEF

Alliance rethought

■ **Andersen Consulting** in Chicago has sold to **SAP AG** in Walldorf, Germany, its stake in its 5-year-old joint venture company. Under a revised relationship, Andersen becomes a charter member of SAP's consulting program for its upcoming R/3 line of client/server financial applications. All Andersen personnel working on the venture will join SAP's R/3 development team.

■ After landing former **Apple Computer, Inc.** executive Del Yocam as its chief executive officer, **Momenta International** in Mountain View, Calif., has now raised $10 million in additional equity financing from its investors. Investing in the pen-top vendor were Nazem & Co., Institutional Venture Partners, Associated Ventures II, NMV, International Venture Capital Investment Corp., Vertex, the Economic Development Board of Singapore and PacVen.

Short takes

■ **Cisco Systems, Inc.** in Menlo Park, Calif., posted fiscal third-quarter profits of $23.2 million, a 50% increase over the same period last year. Revenue for the period ended April 26 was $91.3 million, up 46% from the comparable quarter a year ago. . . . **AT&T** has acquired 88% of **Dataid**, a Paris-based software and service firm, for $88 million. . . . **AGS Information Services, Inc.** in Mountainside, N.J., has won a $4 million contract to develop and install a court management system for the city of Phoenix. . . . **Biesys, Inc.** in Houston is installing its integrated loan system at **Gulf Coast Trust Co.**, a New Orleans-based bank with $72 million in assets. . . . **Apple's USA Division** has named Dan Byrne vice president of customer support. He succeeds Morris Tiradalsky.

Amdahl taps Zemke to get back on track

BY JEAN S. BOZMAN
CW STAFF

SUNNYVALE, Calif. — It is said that an Amdahl Corp. coffee mug left on the chief information officer's desk is worth a $1 million discount when the IBM mainframe representative walks in the office.

But Amdahl's coffee turned muddy last year, as the IBM-compatible mainframe maker was hurt by steep IBM discounts and delays in shipping its latest mainframes and disk drives. Both factors contributed to Amdahl's first-ever quarterly loss.

The task of turning things around has fallen into the hands of Joseph Zemke, Amdahl's president since 1987, who recently assumed responsibility for daily operations from Chairman John C. Lewis.

Zemke recently cautioned shareholders that worldwide business conditions are uncertain and that IBM's pricing will probably continue to be aggressive. Therefore, overhead costs must be tightly controlled, and debt will be somewhat higher than usual.

"We will remember last year [1991] as a time when we learned to deal with uncertainty and to manage for business conditions we had not planned," Zemke said.

Zemke's first priority is to ensure smooth delivery of Amdahl's latest computer, the 5995M, which will compete with the IBM Enterprise System/9000 line. The new machines range up to 310 million instructions per second (MIPS), exceeding the IBM ES/9000 Model 900's 240 MIPS.

The 5995Ms are shipping now as scheduled, but shipments of the high-end models — six- and eight-way processors — have been delayed from the second quarter to the third quarter. No reason has been given for the delay.

Earlier this year, Amdahl also announced shipping delays for its new 6390 disk drives.

To date, about 20 Amdahl 5995Ms have been installed worldwide, and that installed base will grow to about 60 machines by June, Lewis said.

Amdahl also expects quarterly shipments of up to 1,000 of its 6390 disk drives once deliveries commence.

Analysts agreed that Amdahl is not going to coast through 1992. In the first quarter, the company earned $4.3 million, off 63% from the year-earlier period, although revenue increased 11% to $497 million. That followed a fourth-quarter loss of $12.6 million on revenue of $389.8 million.

In the cyclical IBM-compatible mainframe business, the four-year task of re-engineering IBM's special mainframe features — such as Escon and Sysplex — is over. Now, the job of reaping profits has fallen to the sales force.

"Amdahl will get the orders, but IBM's discounts are still in the 40% range," said Frank Gens, a senior analyst at Technology Investment Strategies Corp. in Framingham, Mass. He also noted that CIOs are expecting such discounts because the market is so slow. Both IBM and Amdahl have had to accept trade-ins as down payments.

Amdahl executives are concerned that Wall Street is misinterpreting the firm's backlogged orders as a sign that profits are going to go through the roof. Sales should go well for the first wave of Amdahl 5995Ms, but discounts will keep profit margins modest, Lewis said.

Surge in use of 3½-in. disks shrinks supply

BY CHRISTOPHER LINDQUIST
CW STAFF

A drought of 3½-in. floppy disks has some developers and disk duplication firms digging a little deeper, searching a little longer — and paying a little more — these days. But, although the dry spell is likely to continue at least through the end of the year, it is unlikely that users will be seriously affected.

The shortage first hit late last year with almost no notice, according to vendors and analysts. Several factors have contributed to the situation, including the near simultaneous and dam-bursting release of Microsoft Corp.'s Windows 3.1 and IBM's OS/2 2.0 as well as a sudden and unpredicted swing by users and hardware vendors from 5¼-in. to 3½-in. disks.

David Bunsel, managing director at Santa Clara Consulting, said a combination of falling 3½-in. disk prices, the inherent benefits of the medium (rigidity and smaller size) and the sudden decision by developers to ship products in the smaller form factor left manufacturers gasping for breath.

That, in turn, has caused some concern for software vendors but has left virtually unaffected end users purchasing "branded" disks, which are disks generally sold with the manufacturer's name printed on them.

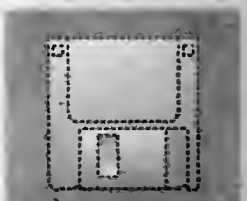
"Users are having very little problem [getting] branded 3½-in. diskettes," Bunsel said. He noted that disk manufacturers prefer the branded product because the manufacturers' quality requirements are not as high as those of some software vendors such as IBM and Microsoft. As a result, yields and profits are higher, which will cause disk duplicators and software vendors to most likely feel the pinch.

Rose Moreau, purchasing director at Lotus Development Corp. in Cambridge, Mass., said that while Lotus has not felt much impact from the shortage, the company is planning its disk purchases further in advance than it previously had.

Microsoft is also forecasting further ahead to make sure disks will be available when necessary.

Disk manufacturers are not using the shortage as an opportunity to gouge prices, said John Deputy, director of marketing at Kao Infosystems Co., a Japanese disk manufacturer with plants in Plymouth, Mass. "The key word for Kao now is to invest in relationships [with vendors]," he said.

As sales of Windows, OS/2 and other recently announced products level out, the shortage should subside. Some manufacturers are in the process of converting 5¼-in. production lines to 3½-in. forms. For example, Kao recently expanded its Plymouth facility to increase production of 3½-in. disks. However, most manufacturers may be wary of expanding out of concern that the current rush to 3½-in. disks will slow considerably, leaving them with excess production facilities.



Fading floppies

A rash of new software, in some cases requiring multiple diskettes, could exacerbate an emerging floppy disk shortage

Total no. of program diskes	
DOS 5.0	3
Windows	4
OS/2	21
Dosgraw	1
Dosgraw/X	7
Windows NT	Unknown

CW Chart: Tom Monahan

Kao ups production

At least one manufacturer is gearing up to face the 3½-in. disk shortage head-on. Kao Infosystems, a $5 billion Japanese firm, recently enhanced its Plymouth, Mass.-based plant, allowing it to produce 26 million of the disks per month in North America — 8.4 million more than was previously possible.

The $135 million expansion will help Kao produce some 430 million 3½-in. disks in 1992, making it one of the largest disk manufacturers in the world, according to the company.

The expanded facility also has the advantage of being easily converted to produce the "extra-density" 4M-byte disks. The extra-density format is currently not common, but industry insiders predicted that it will become more prevalent in coming years — perhaps making up one-third of the disk market by 1995.

A key factor in the 4M-byte disk's market growth will be systems with disk drives compatible with standard-, high- and extra-density disk formats, a feature that IBM is pioneering on some of its Personal System/2s.

CHRISTOPHER LINDQUIST

TRENDS

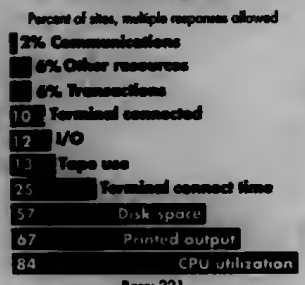
DATA CENTER CHARGEBACKS

...he controversy surrounding the use of chargeback ..., 43% of responding IS departments are using ...rovide a full account of how services are used

PICKING UP THE TAB

Services that users pay for vary. Across the board, CPU use is the most common chargeback

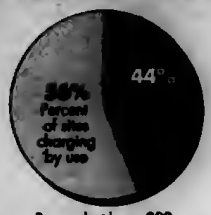
Percent of sites, multiple responses allowed



Base: 221

PLAYING FAIR

Of the sites that have a chargeback system, 56% bill end users by actual use, while 44% simply divide costs among departments

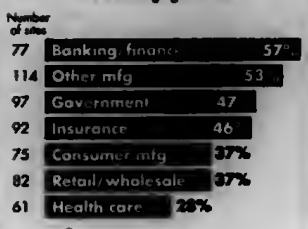


Respondent base: 299

WHO'S CHARGING

Banking and financial institutions are most likely to have a chargeback system in place

Percent charging end users



Source: Xephon WJWS/ Oviedo, Fla.

CW Chart: Guy Stuart

NEXT WEEK

Alex J. Pollock doesn't have a computer in his office. But Pollock, who taught philosophy before embarking on the banking career that landed him in the top executive office at $11 billion Federal Home Loan Bank of Chicago, banks on computer technology to drive just about every other function at Federal Home. See Manager's Journal.

Michael Abramson

Bar codes and scanners may not be the sexiest technologies around, but they do play an integral part in data collection for many businesses — from grocery stores to chip manufacturing firms. Read In Depth to find out more about advances, such as two-dimensional bar codes, that promise to gather more of the operational data needed to run a business.

INSIDE LINES

White noise hurts

▶ Developers of pen-based hardware are discovering that obtaining Federal Communications Commission approval for their systems is a higher hurdle to clear than expected. The reason is the high levels of radio frequency interference emitted from the LCD digitizer displays. The resulting design and manufacturing modification process has delayed shipments of several systems, including Pi Systems' Infolio, which is awaiting FCC approval.

Get out the RAID!

▶ Concurrent with IBM's entry into the automated tape library business next week, IBM executives in Tucson, Ariz., are expected to lift the curtain on plans for RAID technology. Although no products will be announced, analysts said IBM will build a hybrid system by coupling a RAID Class 5 or 6 device with its 3990 disk controller. This is expected to be available by early 1994.

Primal scream

▶ Prime Computer, Inc. is said to be readying an announcement regarding its finances and the future of the 50 series minicomputer line. Users and a large Prime reseller said that Prime may stop enhancing the 50 series but will continue to support users for another five years. An insider at Prime's Computervision subsidiary said talk within the unit suggests Prime is also preparing a Chapter 11 filing. Prime declined comment.

Oppose Sun forever, please

▶ One CEO who isn't losing any sleep over the shifting fortunes of the Open Software Foundation these days is Sun's Scott McNealy. The OSF is the best thing that ever happened to Sun, he says. "It confused the market and created the perfect opportunity for our focused, deliberately belligerent strategy to win," McNealy claims. "I'm just afraid that when OSF runs out of money next year, IBM, DEC and HP won't ante up again. They might take all that money and put it on real products."

Open sesame

▶ KnowledgeWare may publish the application programming interfaces (API) for its CASE repository with the next release of its integrated CASE tool set, a source close to the company confirmed. Selling ADW/Encyclopedia's APIs to third-party developers would "promote the building of add-ons for our products, which can only be good for us," the source said, adding that a final decision is expected "in a couple of months." But KnowledgeWare better make up its mind quickly because officials have already pledged a mid-1992 (i.e., next month) debut for Application Development Workbench Version 2.7.

Multimedia mania

▶ IBM's attempt last week to demonstrate part of its vision of the future fell a bit short, despite claims that the technology it used is on the market today. A live multimedia videoconference between IBM's Robert Carberry and Joe Guglielmi, head of IBM's Taligent joint venture with Apple, kicked in successfully, but after a minute or two, the sound connection failed. Attendees were left to read Joe's lips. IBM cut off the demo quickly, but even while it was working, the audio was out of sync with the video.

IBM Japan workers have been told to relax, according to a Japanese press report. The company reportedly asked managers to set an example for their staff by taking more holidays. The firm said it plans to trim working hours from 1,923 in 1991 to 1,873 this year. The goal is to cut back working hours to 1,800 annually by 1994. To reach this goal, workers will be encouraged to take an average yearly paid leave of 17 days, up from 14 days in 1991. The Japanese government has been pressing companies and employees to relax more to help reduce trade imbalances caused in part by Japan's long working hours. Got a hot tip? Phone, fax or CompuServe News Editor Alan Alper at (800) 343-6474, (508) 875-8931 or 76537,2413, respectively. Or try Computerworld*'s 24-hour voice-mail tip line at (508) 820-8555.*

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